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Editorial.

ARMY REFORM.

THE whole political atmosphere is filled with this cry at the present time, and every newspaper and magazine contains more or less sane and more or less practicable schemes for the regeneration of our army and the rehabilitation of our character as a military and colonising power. It is sincerely to be hoped that with this important object in view, and with the troubles and disasters of the past eighteen months behind him, the Secretary for War will not overlook the claims of the Veterinary Department. It is idle to object—if any one does object—that we are a small body. Rather ought our claims to be more carefully considered ; the importance of little things is acknowledged by all wise men, because the neglect of them is apt to bring about calamities, all the greater because unforeseen. We have all heard the story of the Dutch boy who, observing on his way home at night a leakage in one of the dams that protect his country from the invasion of the sea, and fearing that the immense weight of water would gather strength and enlarge the crevice till it became a huge rent, thrust his arm into the hole till help came with the morning light, and found him benumbed and helpless, it is true, but victorious over his gigantic adversary. It is surely permissible to us veterinary surgeons to suggest that we are the omitted factor in the arithmetical problem set by destiny to the British War Office, and that our omission has totally vitiated the calculation. Or we may recall the homely proverb about the nail that was lost, whereby the horse-shoe and the horse and his rider were lost, and many grave disasters were necessarily involved. How otherwise are we to account for the confusion that has taken place in the conduct of, shall we call it, the horsing department in South Africa? Can we attribute the enormous losses in the way of horses and mules in that country to unavoidable disease or to causes beyond our control? Let us refer our readers to the Houston case, which came before the English law courts a few days ago, regarding the loading of bad hay on board a transport at Liverpool for South Africa. Where was the veterinary officer all the time? Who is

the best judge of what is suitable for horses' food, and who ought therefore to decide in such cases? Further, we may ask, did a veterinary officer examine each transport steamer and satisfy himself that the fittings were of the kind necessary for the comfort and safety of horses on a long and possibly stormy voyage? If it was not a veterinary officer, then let us know if any special training had been given to the men who did superintend. One might deduce from the facts of the case that these superintending officers were *better* fitted than the ordinary veterinary officer for the important task; if not, why were they chosen? If so, let us by all means learn from the War Office wherein their superiority lay, and let us improve our teaching accordingly and give the younger generation of veterinary students a chance of qualifying for such important and, we suppose, lucrative posts.

In time of war, when the vital interests of the nation are at stake, we send out our ablest and most experienced general officers to take command of the troops. Has the War Office done this in connection with the Veterinary Department? There are some 140 officers in the Veterinary Department, but only some forty or fifty have been despatched to Africa. What has become of the rest? They certainly have not been all sent to purchase remounts; those who have been could be counted on one's fingers. It is true the War Office has engaged some hundred or so of Civil Veterinary Officers for service in South Africa, but it has bungled even here. Many of these civil officers we know to be men of ability and some of them of considerable experience, but they have frequently found themselves placed under the command of youths of twenty-two or twenty-three, new-fledged striplings full of the vanity of office and ready to decide the most momentous questions, quite indifferent to the opinions of their elders, and persuaded of the omniscience which His Majesty's commission entails. We should like very much to hear the private opinions of the Civil Surgeons on this strangely inverted system.

Again, why should the Army Veterinary Department be in such a position that in time of peace it cannot fill its ranks, and consequently, when war breaks out, has to rush wildly into the market and engage at short notice civil surgeons—not only men of British birth, but even foreigners.

Still another point is this—In time of peace an Army Veterinary Surgeon has under him a staff of twenty to twenty-five men whom he thoroughly trains for hospital work, but when he is sent to the seat of war these trained men are taken from him and scattered over the field forces—promoted, we presume, for the time being to posts for which only professional veterinary surgeons are fit!—and the army surgeon is left with a scratch lot of ordinary soldiers, who blunder and muddle along as best they can, trying to obey instructions which they do not understand, and perhaps frightened to death with an unruly, plunging, and rearing horse which they are

supposed to be tending, but which in their hopeless ignorance they are only maddening.

There are other and minor considerations which we do not touch upon at present, except to mention them, such as protection in the field—the same as the Royal Army Medical Corps—pay, promotion, leave of absence, pension, and bounty, which in many cases are quite illusory, and which have for their result discontent and disappointment, and therefore make the future of the profession, and, what is much more serious, of our field forces and our army generally, a matter of dismal conjecture. In a future article we may discuss the matter of continuation of study for Army Surgeons, whereby they may bring their professional knowledge up to date, but at present we are too despondent.

Royal College of Veterinary Surgeons.

SPECIAL MEETING OF COUNCIL HELD AT 10 RED LION SQUARE, W.C., ON WEDNESDAY, JANUARY 30TH, 1901.

Present — A. C. Cope, Esq., *President* (in the Chair); Veterinary Colonels Lambert, C.B., Duck, C.B.; Professors M'Fadyean, Penberthy; Messrs. Barrett, Dollar, Mulvey, Simpson, Villar, Wragg, Thatcher (*Solicitor*), and Hill (*Secretary*).

The PRESIDENT said he felt it his duty to convene a special meeting for the purpose of sending an address of condolence to the Royal Family on the occasion of the death of the Queen.

The SECRETARY read the following letter :—

"GENTLEMEN,—I am desired by the President to invite your attendance, if possible, at a Special Meeting of the Council of the Royal College, when he will propose to the Council, as representative of the whole body corporate, that a vote of condolence be tendered to His Majesty the King on the death of Her late Majesty Queen Victoria, his Royal mother, and also to congratulate the King upon his accession to the throne. The meeting will be held on Wednesday next, 30th January, at 2·30, in the Council Chamber of the Royal College. An early acknowledgment of this proposal on the part of the President will oblige.—Yours faithfully,

A. W. HILL (*Secretary*)."

In reply to that letter, the Secretary stated that he had received intimations from the following gentlemen of their intention to attend :—Veterinary Colonels Lambert and Duck; Professors M'Fadyean and Penberthy; Messrs. Dollar, Villar, Mulvey, Wragg, and Barrett.

Letters had been received from the following gentlemen regretting their inability to attend, but heartily approving the President's proposal :—Professors Dewar, Edgar, Williams, M'Call; Messrs. Abson, Allen, Bower, Byrne, Carter, Fraser, Hartley, Lawson, Locke, Mason, Trigger, Wartnaby, and Winter.

The PRESIDENT said it was not his intention to inflict npon the Council

a feeble speech eulogising the qualifications and beautiful character of Her late Majesty. All her virtues were written and impressed upon the sands of time, which for ever and ever will be read by those who followed after. But as representatives of the profession I felt that it was their duty to recognise with gratitude the kindness of her disposition when she granted the Charter by which they became legally constituted a profession, and which as a matter of fact raised them to the position they now held. He hoped his suggestion that a vote of condolence should be addressed to the King would meet with their cordial approval.

Draft addresses were brought up by the Secretary, and considered by the Council.

After discussion, it was resolved that the following address of condolence and congratulation be sent to His Majesty the King :—

"The Council of the Royal College of Veterinary Surgeons, assembled in special meeting for the purpose, and as representative of the whole profession, express their sincere grief at the death of Her late Majesty Queen Victoria, during whose benign reign the veterinary art was by Her Royal Charter recognised as a profession, and has received protection and encouragement.

"They desire to place on record their appreciation of her many high and noble virtues, and especially of her sympathy with each and all her subjects.

"They also desire to condole with His Majesty King Edward VII. and the Royal Family on the great loss they have personally sustained.

"They humbly congratulate His Majesty on his accession to the throne, and assure him of their unswerviug loyalty and devotion."

On the motion of Professor PENBERTHY, seconded by Mr. SIMPSON, a vote of thanks was passed to Mr. Cope for presiding.

Original Papers.

A CONTRIBUTION TO OUR KNOWLEDGE OF DISEASE OF THE NERVOUS SYSTEM IN HORSES.

BY CHALMERS WATSON, M.B., M.R.C.P.E.

VERY little is known as to the etiology, symptomatology, and pathology of diseases of the spinal cord in the horse. To quote from Friedberger and Fröhne—"The pathology of the spinal cord and spinal meninges is still very imperfectly known in veterinary medicine. Observations on this nosological group are rare, and much less precise than in human medicine, a fact due to the absence of any objective symptoms in the different diseases of the cord, and the difficulty of their diagnosis in animals. At the present time we can give only a very incomplete description of these diseases." The authors then devote a short section to (1) Cerebro-Spinal Meningitis—spasm of the neck; (2) Myelitis and Spinal Meningitis—the introductory sentence here, "In the different domestic animals the special forms of meningitis and myelitis cannot be differentiated clinically," gives a clear statement of the views at present held by veterinary experts on this subject; (3) Paralysis through compression of the Spinal Cord.

The present paper is a contribution to the knowledge of spinal cord affections in the horse, and is intended to show that a more careful study of the objective symptoms that are undoubtedly to be found, if looked for, considered along with a slight knowledge of the conditions met with in the human subject, may lead to two things. In the first place, this study would, I think, demonstrate that chronic diseases of the spinal cord occur by no means infrequently, and that they are, to a considerable extent, dependent on auto-intoxication from a general and local derangement of nutrition. From this it follows that such diseases ought to be curable *in their early stages.* But a second and even more important result might be obtained, viz.—There is good ground for the belief that a study of the derangements of the nervous system in the domestic animals, made along the lines here indicated, would add materially to our knowledge of allied disorders in the human subject. The present case—which is, so far as I am aware, unique—alone suffices to suggest to medical men many points of the greatest interest; and it is hoped that its publication may lead to the recognition and detailed investigation of similar cases, with the view of extending our knowledge both of human and veterinary medicine. Before going further, and for the better understanding of what is to follow, it is, I think, advisable to give a very short outline of the more common diseases of the cord in the human subject.

These are usually classed either as systemic[1]—in which a definite system or tract is involved,—or as focal—where the lesion or lesions occur indiscriminately throughout the cord.

Of the system lesions, *Locomotor ataxia* or *Tabes dorsalis* takes first place. This is a disease involving the postero-internal and postero-external columns, the posterior nerve roots, and, very frequently, other tracts of the cord. Its leading symptoms are sensory. An ataxic gait—a gait irregular and inco-ordinated, due to imperfect control over, rather than to weakness in the affected muscles; lightning pains in the affected limbs; alteration in the pupillary reaction, the pupil not reacting to light although influenced by accommodation; and certain articular and other changes of a neurotrophic nature, these being most frequently seen in the earlier stages of the disease. The attention of the medical profession was first drawn to the joint disease present in these cases by the great French neurologist Charcot, and the condition still goes under the name of "Charcot's Joint Disease." Briefly, the joint changes in a typical case are as follows:—Symmetrical painless enlargement of both joints (usually the knees), with thickening and increased vascularity of the soft tissues, a varying excess of fluid, unnatural mobility of the joint, and an alteration in the bony structures entering into its formation, either of the nature of enlargement and sclerosis or diminution and rarefaction of the bone. I would draw particular attention to these points, in view of the description later given of the joint changes in the present case. Before leaving this question of locomotor ataxia, I would just add that it is by no means rare to find distinct evidence of motor weakness in the affected limbs; some disturbance in the organic reflexes—bladder or rectum—is also a common symptom. While this disease is essentially one of adult life, cases of juvenile tabes are recorded. Mention should also be made of *Hereditary*

[1] Too much attention is paid to this classification. See reference to present views on the etiology of locomotor ataxia on page 140.

Ataxia (Friedreich's Ataxia), a disease of the posterior columns mainly, whose etiology is supposed to be quite distinct from that of locomotor ataxia.

A second system lesion is one known as *Lateral Sclerosis* or *Spastic Paraplegia.* The former term indicates the situation and nature of the lesion, the latter is derived from the clinical picture. This is a chronic affection involving primarily the descending motor tracts, the crossed pyramidal and direct pyramidal tracts; the clinical features are mainly motor, and comprise muscular weakness and a marked degree of spasticity in the gait. The affected limbs are raised in a spasmodic manner and put down on the ground with a jerk that is often very striking, and not unlike the type of movement seen in aggravated cases of stringhalt in horses.

Disseminate Sclerosis is a condition characterised by numerous foci of sclerosis scattered throughout the white matter of the cord and brain, the medullated fibres being lost and replaced by altered neuroglial tissue. The leading symptoms are spasm of groups of muscles, induced when voluntary movements are attempted, and a varying degree of paresis and disturbance of sensibility. The muscular symptoms are sometimes well exhibited in the smaller muscles of the eye, lips, &c. It has to be borne in mind that the situations of the diseased foci are quite irregular, and the symptoms are correspondingly varied and complex. In the later stages the clinical features may closely simulate those of spastic paraplegia, and in many cases a differential diagnosis is impossible.

The clinical symptoms seen in a "shiverer" seem to me to stand comparison with those of disseminate sclerosis in the human subject; the resemblance is, I think, sufficiently close to justify the recommendation that these cases should be investigated from this point of view. We must, of course, always bear in mind that horses are destroyed at a stage of the disease corresponding to the early phases in the human subject, and a very careful and detailed examination of the nervous system is necessary before stating that none of these focal lesions are present.

A few words regarding the lesions of the *grey matter.* We have an acute disease, "*Polio-myelitis anterior acuta,*" a condition characterised by destruction of the cells in the anterior cornua of grey matter, with associated paralysis and wasting of the corresponding groups of muscles, and believed to be due to an infective organism; the condition is most frequently seen in infants and children, but is occasionally met with in adults. A similar but chronic and progressive process, "*Progressive muscular atrophy,*" is characterised by gradual destruction and loss of the cells of the grey matter, with associated paralysis and wasting of muscles, and ending in death from asthenia, extension to the medulla, or some intercurrent illness.

Syringomyelia.—A rare affection of the cord, characterised by the formation of cavities in the grey matter, usually near the central canal. The etiology of this condition in the human subject is even more obscure than that of the other affections. The leading clinical features are a peculiar disturbance of sensibility, alterations in the joints of a nature not unlike those found in locomotor ataxia, and progressive muscular atrophy attended with paralysis. The following views have been advanced in explanation :—

i. A congenital defect in development;
ii. A spinal gliosis, of an inflammatory or other nature, due to an unknown irritant;
iii. The result of vascular disease.

Before leaving the above, I must add that extremely little is known as to the etiology of the foregoing diseases; they are regarded as incurable affections. All the chronic affections are associated with more or less sclerosis of the cord, that is, replacement of the spinal parenchyma by a less highly organised tissue, and a varying degree of vascular change. Present authorities are practically unanimous in believing that the vascular changes (thickening and other changes in the walls) are secondary and not primary factors, and that the primary change is one of the neuron. They regard the changes in the vessels as the result and not the cause of the degeneration of the nerve fibre. The present case illustrates that here at any rate the vascular disturbance was the primary factor, the changes in the parenchyma being secondary.

Before describing it, I think it advisable to give a short account of isolated records of spinal cord disease in the horse, obtained from veterinary literature.

The most recent and probably the most elaborate and authoritative account of the subject is given in a paper by MM. Hendrickx and Lienaux (*Annales de Médecine Vétérinaire*, Janvier 1900). These authors give a resumé of the few recorded observations on disease of the spinal cord in the horse, and rightly conclude that the data are too few and also too dissimilar to allow of any definite statement on the subject. They further express the opinion that cases of myelitis are by no means infrequent. The cases quoted by them may here be shortly summarised.

Cadéac (*Pathologié interne*, tome viii.) describes under the terms *disseminated myelitis*, *multiple myelitis*, or *combined pseudo-systemic sclerosis*, "an inflammation more or less acute, or simultaneous sclerosis of the posterior and lateral or more columns, circumscribed or diffuse foci of disease, involving particularly the region of the posterior horns, and arising from an arteritis of the median spinal artery."

Weber and Barrier have recorded a lesion in the right side in the cervical region and in the left side in the lumbar area. In the former the diseased focus was 1½ centimetres long, and involved a great part of the posterior and nearly the whole of the lateral column. In the lumbar region it was 2 centimetres long, and arranged in three principal foci, two of which were situated behind the posterior horn of grey matter, the third lying internal to the anterior horn.

Dexler has recorded a case of disseminated myelitis, the lesions being small foci of hæmorrhagic inflammation in the brain and cord.

In a case described by Hamburger an asymmetry of the cord was found, which was believed to result from atrophy of the left half of the organ. This author attributed the atrophy to an arrest of development; in the same animal he found diverse lesions in the white matter and posterior horns of grey matter.

The clinical features of the foregoing cases are described as a disturbance of the muscular power resembling locomotor ataxia in the human subject. Before describing the case of Hendrickx and Lienaux, I would like to state here that, in my opinion, one cause of the want of a more accurate knowledge of the etiology and pathology of these cases lies in the erroneous impressions apparently existing as to the correct use of the terms myelitis, inflammation, and the like, as referred to above.

Hendrickx and Lienaux described the clinical features and pathological appearances in their case in considerable detail in their article on "Ataxie

locomotrice d'origine médullaire chez un cheval—Sclérose des cordons supérieurs localisée au renflement cervical."

The clinical history of the case was briefly as follows: The animal first came under their observation through being sent to the medical school for operative treatment for two spavins supposed to be the cause of lameness. The history showed that the animal, an eight-year-old, became lame in the near hind leg two months before his admission to the college; this lameness at first disappeared with exercise. In three weeks the off hind leg was also affected, and some days subsequently the near fore leg. The previous history of the subject was not ascertained. The authors apparently soon satisfied themselves that there was no real lameness, and they regarded the exostosis (spavins) as incidental conditions of no clinical importance.

The appearances, which had given rise to the original diagnosis of lameness, were ascribed by them to a weakness, as a result of which the animal raised the limbs without bending them (mouvement de harper), with an associated rocking movement of the hind quarters. The same appearances presented themselves when the animal trotted. As a result of an examination of sensibility, made by the application of pin-pricks at numerous points, the authors concluded that sensibility was impaired in the fore and hind limbs, especially in their internal aspects. The clinical appearances led to a diagnosis of a lesion of the cord, probably of the posterior columns. Before describing the pathological appearances, a few words may be said as to the progress of the case.

No disturbance of the bladder or rectal functions was ever observed. The difficulties in locomotion gradually increased; the depression of the haunches and lateral oscillations of the trunk became more pronounced. The general sensibility became normal, and later indeed appeared to be, if anything, increased. The toes dragged along the ground, and the animal became more easily fatigued. In the stable it was observed to lift the fore legs alternately as if to ease them for the moment, which movement, along with a spastic action of the same limbs, led to excessive wearing of the shoes and underlying hoofs. There also developed an apparent hypertrophy of certain groups of muscles, a condition which appeared to the authors not to be specially related to the general disorder. Repeated examinations were made to test the reaction of the pupil, and the influence of the sense of sight on the disorder; the pupil reacted to light, and when the head of the animal was covered no alteration was observed in the degree of motor disturbance.

Autopsy.—With the exception of the spavins and some chronic arthritis, involving the joints of the scaphoid, cuboid, and cuneiform bones, nothing noteworthy was found outside of the nervous system.[1] The local changes in the limbs were probably incidental, and possessed little or no etiological significance. The spinal cord was examined throughout, and the following condition of affairs noted. To the naked eye the cord in the cervical region appeared markedly depressed and altered in colour. This change, which was limited to the posterior part of the cord, was most apparent in the region of the seventh cervical vertebra, and gradually diminished in intensity right up to the medulla. On section the white matter of the posteriorcolumns in the cervical region in the most affected part (seventh cervical and first dorsal)

[1] No details are given as to the nature of the investigation of the viscera, &c.

was found to be replaced by a brownish tissue, indicating a distinct lesion of the posterior columns. Microscopic examination showed that the greater part of the posterior columns in the region just referred to was sclerosed. This sclerosis appeared to be most developed around the vessels. In the anterior columns of the cord in the region of the first dorsal there were two small diseased foci where the nerve fibres were rarified. The rest of the cord was healthy. The authors concluded that the arterial sclerosis was the primary affection; that the main lesion was in the posterior columns in the region of the seventh cervical and first dorsal; that the changes in the upper part of the cervical cord were those of an ascending degeneration. No details are given as to the nature of the methods of examination adopted, and no reference is made to the fact that the lesions discovered are inadequate to account for all the clinical features.

An interesting case has previously been described by a medical man (Drummond, in *Brain*, vol. x., 1887). A donkey, aged about twenty, showed a gait characterised by great inco-ordination; the limbs were thrown out very irregularly, and the animal reeled from side to side. The defects appeared to be due more to a want of control than to actual paralysis. The pupils were markedly contracted, and did not react to light; when the head was covered the animal rolled and fell to the ground. Post-mortem examination of the lumbar cord apparently showed no gross lesion; on further preparation and histological examination a deep red zone (carmine staining) extended nearly half-way round the postero-lateral surface. This appeared to be an annular or marginal myelitis or sclerosis, which embraced both posterior roots, and extended into one lateral column. The changes are described as chronic, apparently independent of meningitis, and essentially interstitial. In this case also the above findings are quite inadequate to account for all the clinical features.

AUTHOR'S CASES.—I.

A Cart-Horse, eight years old.—A cursory glance showed an apparently young horse in a state of poor nutrition, with a keen and intelligent head, four good legs, and a slight ventral hernia. A longer inspection, the animal being still at rest, indicated that the impaired nutrition was rather more pronounced in the muscles of the back and hind quarters, that both the stifle joints were markedly enlarged, that the hind limbs were kept wider apart than normal, and that he tended to knuckle over at both fetlock joints. On being made to walk, he was observed to be weak in the hind quarters, this being evidenced by frequent knuckling over at both fetlock joints, and also by the manner of movement of the limbs as a whole. He lifted his feet badly, the movement appearing to be more of a dragging nature than a true muscular effort, and the limbs were kept widely apart, presenting the appearance known to stablemen as straddling gait. The defects were made more apparent on trotting and galloping, both of which movements could be carried out for a short distance. When slowing up at the end of fifteen or twenty yards the weakness and inco-ordination were especially marked. When an attempt was made to back him this was found impossible, and he could easily have been knocked over if the attempt had been persisted in. During the attempted movement each foot was markedly misdirected. On turning him round there was marked loss of co-ordination between the hind quarters (at the sacro-iliac articulation)

and the rest of the body, the condition displayed being an aggravated one of that known as a "Jinked back," the pathology of which is unknown. Any attempt to turn him round sharply or in a narrow radius at once completely upset his equilibrium, making him tend to fall, and at the same time it brought into greater prominence the muscular inco-ordination, the weakness, and the bilateral affection of the stifle joints. This latter condition was one familiar to veterinarians as "out in the stifles," and its etiology is not yet determined. The clinical features were—1, enlargement of the joint, in which both the soft and bony tissues seemed to participate; 2, fluid accumulation in the joint; 3, unnatural mobility of the joint as a whole; and 4, an apparent dislocation and preternatural mobility of the patella. As has been mentioned, this condition was present in both joints. (It is sometimes met with involving one joint only, and is then supposed to be due to traumatism.) All the other joints appeared normal, with the exception of the sacro-iliacs, which showed unnatural mobility, without any other obvious abnormality. As I only saw the animal on one occasion, I had no further opportunity of investigating other symptoms.

After reviewing the features of ataxia, muscular weakness, and bilateral joint-affection, I concluded that the animal suffered from a lesion of the spinal cord, involving mainly the posterior columns, of a nature akin to tabes dorsalis in the human subject.

CLINICAL HISTORY OF THE CASE.

I have obtained the following notes from a former owner, who bought the horse as a four-year-old and parted with him a year later: his statements are based on information derived from the subsequent owners as well as on his own personal knowledge.

The hernia, the weakness in the legs, and the "stifled joints" were present at four years of age, but did not interfere with regular work. "He worked heavy cart work both up and down hill." He was not sound at first, often showing lameness; he "practically always tripped," but "showed no signs of falling."

After a stiff day he held his legs up and "seemed to be pained but not violently." There was no bladder nor rectal trouble so far as observed; he always fed fairly well.

Valuable as these notes are, they must only be regarded as a very general statement. The fact that the animal came under the writer's observation at the "knackeries" within a few weeks of his leaving the above district, indicates that the disease had progressed sufficiently to render him useless for ordinary purposes. I may say that the last owner of the horse was a man whose business consists in shipping spent horses abroad, and he informed me that this horse was not shipped because he would not have been able to keep his feet on the voyage. The weakness was apparently of central origin, as the limbs, with the exception of the stifle joints, were relatively much sounder than the limbs of the majority of the horses that would have been his companions on the voyage.

AUTOPSY.

The main interest of the case lay in the condition of the spinal cord and in the stifle joints, and these were investigated within three days of the animal's death; at the same time the whole bony skeleton was examined,

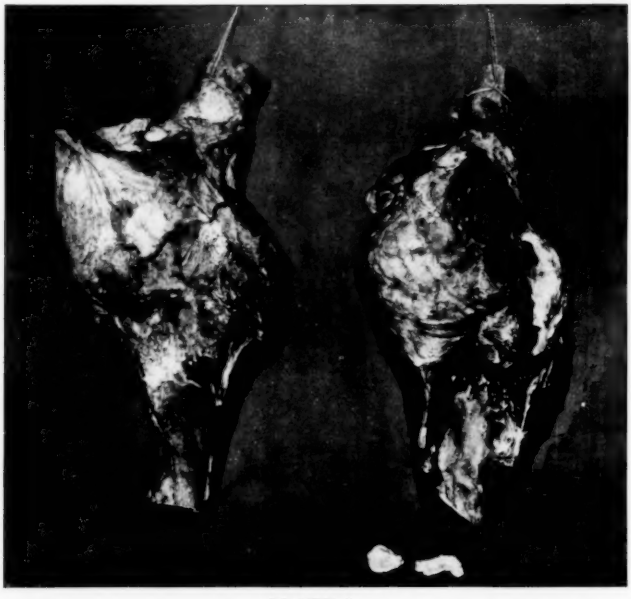

PLATE I.

The stifle joints, suspended by the lower end of the femur. The illustration gives a general view of the great enlargement of the soft tissues, and shows two bony masses found encapsulated *outside* the joint. The fluid in the joints had been previously lost.

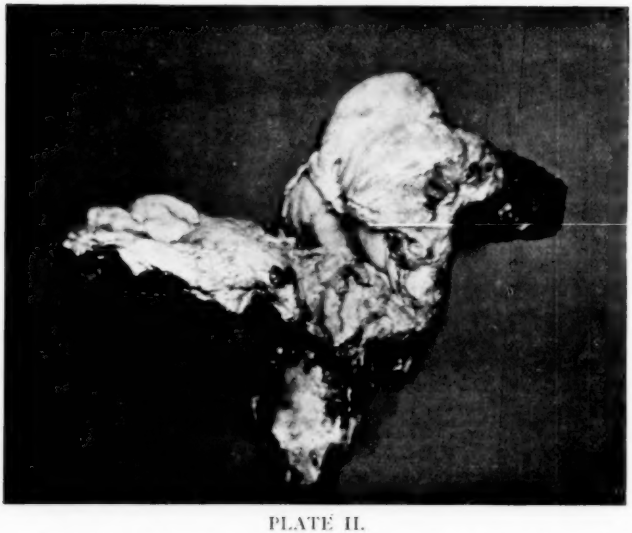

PLATE II.

The interior of the stifle joint. The anterior part of the capsule, with the patella, has been reflected downwards and forwards.

NOTE—(*a*.) The marked enlargement of the soft tissues. The thickness was 1¼ inches at the position of the broad white line.

(*b*.) The enlargement of the lower end of the femur. The illustration gives a faint indication of the irregular thickening of bone at the upper margin: a similar irregularity is present at one margin of the patella.

(*c*.) An area of ulceration is visible on the articular surface of the patella.

and especially the state of the bone marrow. Unfortunately the state of the viscera was not ascertained.

The Joints.—All the joints appeared to be normal with the exception of the stifle, sacro-iliac, and tarsal joints. The two latter exhibited relatively unimportant lesions; the tarsus on either side showed slight chronic articular changes of a nature common in old horses; while the lesion in the sacro-iliac articulations was of the nature of elongation of the capsule, which allowed unnatural mobility of the joint. The latter lesion is possibly not without some significance, as indicating a very minor degree of the derangement present in the stifle joints. When I first saw the sacro-iliac articulations I formed the impression that their state might explain the readiness with which the condition of "jinked back" was induced, but I abandoned this idea on subsequent examination of a similar case where the joints appeared normal. The main interest therefore lies in the condition of the stifle joints. As the condition of the two joints was practically identical, one description will suffice for both.

The joint was enormously enlarged, being about twice the normal size, even after a large quantity of dark thin fluid had been withdrawn; the enlargement was found to be mainly in the soft tissues, although the bony structures also were markedly affected (see Plates I. and II.). I did not see the fluid, and unfortunately it was not preserved. [In similar cases it would be advisable to have its nature determined by chemical examination.] Two addimentary bony masses were found encapsulated *outside* one joint, three similar were found lying free within the cavity.

They varied in size from $1\frac{1}{4}$ in. to $\frac{3}{4}$ in. long, 1 in. to $\frac{3}{4}$ in. broad, and $\frac{1}{2}$ in. to $\frac{1}{4}$ in. thick, and were irregular in shape and surface. Two of them are shown in the illustrations.

The Capsule was enormously thickened, varying from $\frac{1}{2}$ in. at its narrowest to $1\frac{3}{4}$ in. at its broadest point; internally the tissue was of soft consistence and presented an œdematous and in parts almost gelatinous appearance, and was highly vascular; more externally the tissue was extremely hard and of almost cartilaginous consistence. The only part of the capsule examined microscopically revealed exceedingly dense fibrous tissue.

The Cartilages.—The inter-articular cartilages appeared normal; the articular surfaces were diseased. Here and there the cartilage was ulcerated, sometimes over a considerable area; in other parts marked thickening was observed. At no point was the bone exposed. The surface of the cartilage in some areas appeared irregular from the presence of small greyish white millet seed granulations. Histological examination of a picro-carmine stained section showed the markedly darker tint on the surface and at its deeper part characteristic of diseased cartilage. In these areas the matrix was markedly fibrillated, and here and there were groups of cells surrounded by this fibrillated matrix, indicating a proliferative condition. In the general faintly stained areas the cells were more numerous, and also more irregular than usually obtains, at least in the human subject. The appearances were thus not characteristic, as this description is applicable to any chronic irritative condition in articular cartilage.

Bone.—The bony enlargement of the lower end of the femur was pronounced; the patella was distinctly enlarged; the head of the tibia was only slightly involved. At the upper margin of the articular surface of the

femur there was a margin of new bone-formation of an irregular nodular type, and there was similar irregularity at the margin of the patella.

Bone Marrow.—The marrow of both femurs was almost uniformly dark red in colour. Here and there it presented a slightly gelatinous appearance, and towards the head of the bone it was more fatty. In the other long bones the marrow was uniformly yellow, and soft in consistence. This condition in the femur led me to examine the marrow of about twenty animals, of all sorts and conditions, taken at random.

This investigation showed a similar condition in nearly all the cases, only varying considerably in degree. As I have not been able to ascertain definitely the normal appearances of marrow in the horse, I am unable to express any opinion as to the significance of the condition described in the present case. But I believe that we have here a very important and almost entirely ignored line of investigation of disease.

The Spinal Cord.—Naked Eye Examination.—The cord was examined in the mid cervical, mid dorsal, and lumbar areas. In the *lumbar region* the cord was abnormally soft in consistence, and presented a collapsed appearance, with an excess of cerebro-spinal fluid. A close examination revealed actual loss of tissue in the posterior part of the cord extending fully an inch in length (see Plate III.). On section the grey and white matter could not be differentiated.

The *dorsal cord* appeared to be perfectly normal. The *cervical cord* also appeared normal, but on later section of the hardened tissue a large cavity was found, involving the grey matter and posterior nerve root, and extending vertically about half an inch.

Methods of Examination.—The tissues were fixed in formalin and chrome alum copper solutions [1] and cut in dextrin. The softer tissues in the lumbar and cervical cord were embedded in photoxylin. The staining methods used were hæmatoxylin and eosin for the vessels; the old Weigert and Weigert-Pal for the medullated fibres; methyl-violet method for the neuroglia, and Toluidin blue for the nerve cells. The Marchi method was applied to the dorsal cord.

Histological Examination.—It is advisable to give the results in some detail, but, for convenience, a more concise summary will follow. Owing to the soft nature of the tissues, especially in the lumbar and cervical cord, and to the fact of their not being obtained as soon after death as was desirable, the examination was rendered unusually difficult. For the same reason some of the illustrations of the cord are not so good as they might have been.

Lumbar Region.—The low power view of a hæmatoxylin and eosin stained section showed a profoundly diseased cord. This disease was most apparent in the posterior columns, in the posterior nerve roots, and in the grey matter; the last mentioned was, however, a focal lesion. In addition to these grosser changes, it was evident that the vessels throughout the cord were diseased, this being evidenced by an apparent increase in their number, and occasionally by the presence of markedly dilated vessels, either venous or arterial. This apparent increase in number was due to the presence of vessels normally invisible, but revealed by the thickening of their walls. The vascular disease was much more pronounced in the posterior part of the cord, but was not confined to to that region (see Plate IV.). The contrast between the general appearance of the nerve fibres in the anterior and posterior columns was very striking. The

[1] For full details the reader is referred to *Pathology of Mental Diseases*, by Ford Robertson: Edinburgh, 1900.

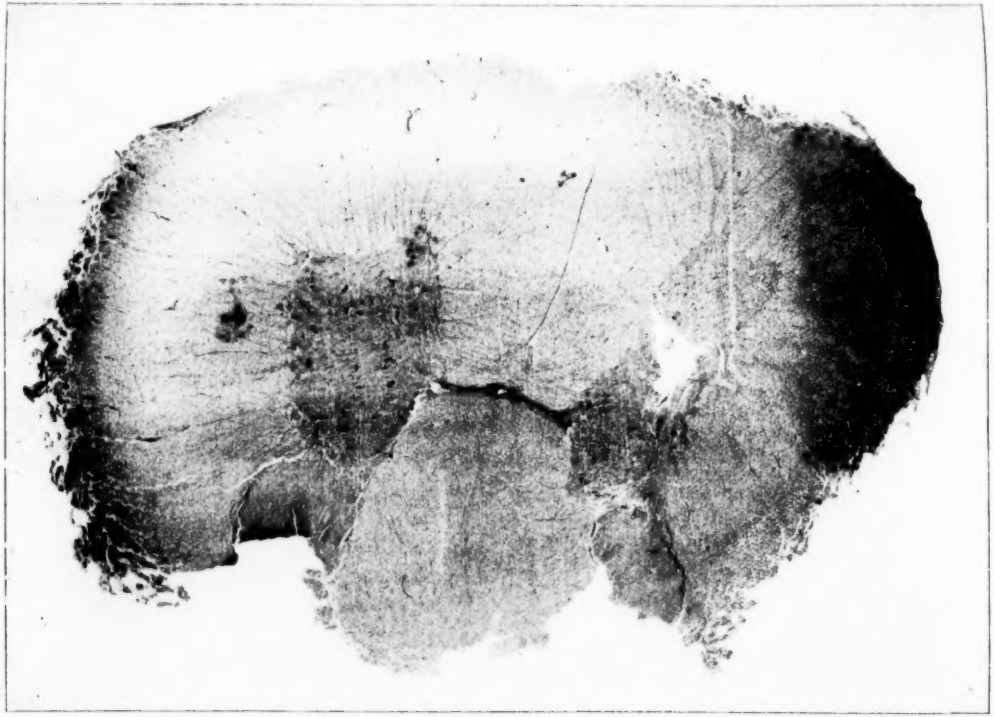

PLATE III.

Lumbar cord. Photoxylin section stained with hæmatoxylin and eosin. Shows—(*a.*) Marked loss of fibres in the posterior columns and in the region of the posterior nerve roots.

(*b.*) Cavity in the anterior cornu.

(*c.*) The irregularity visible at the margin of the cord anteriorly is due to the rarefaction of nerve fibres referred to in the text (*q.v.*). *See also Plate IV.* × 10.

NOTE.—The differences in the colour of the various columns in this illustration are misleading. For an account of their condition see text.

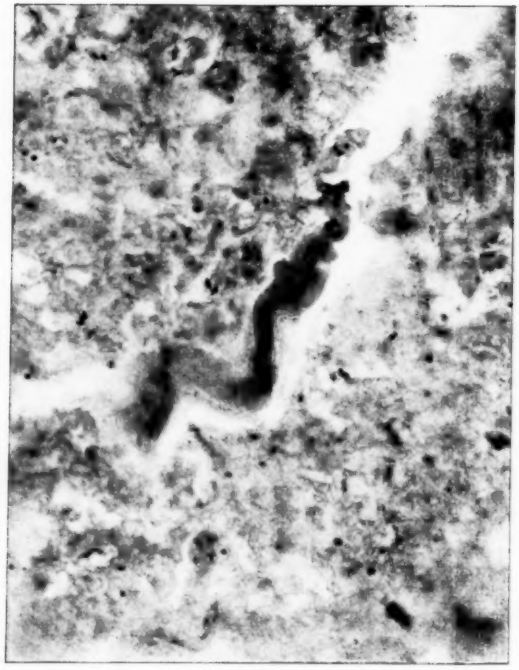

PLATE IV.

Shows one of the many diseased vessels at the margin of the softened area in the posterior columns of the lumbar cord. The change consists in advanced hyaline and fibroid thickening, which has probably led to complete obliteration. × 200.

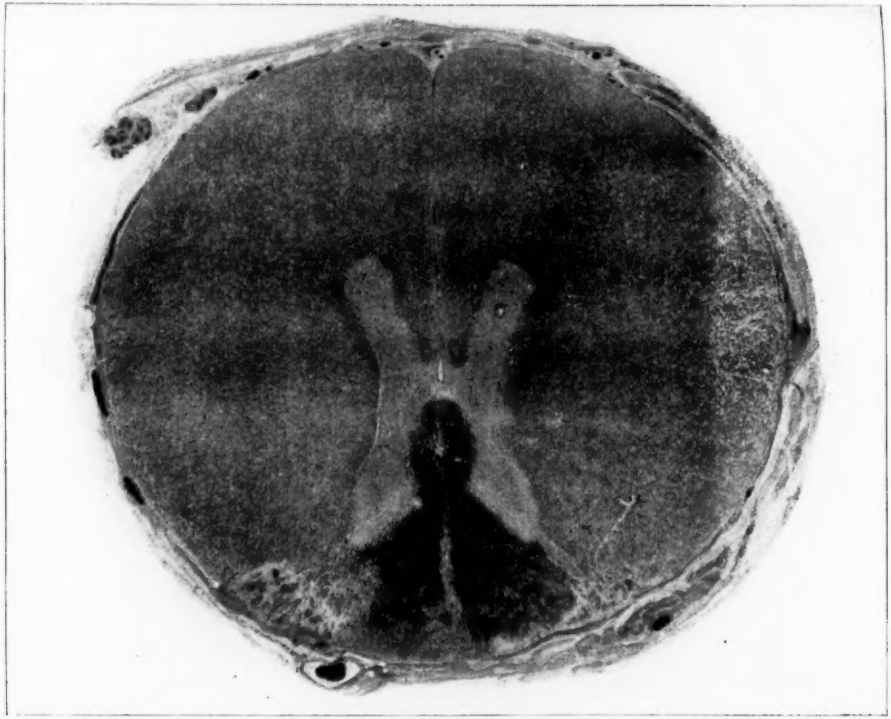

PLATE V.

Dorsal cord. Marchi method. Note the dark stained area in the posterior columns, an ascending degeneration due to the destruction of the nerve fibres in the lower part of the cord.
The illustration does not indicate the scattered degenerated fibres in the rest of the cord. × 10.

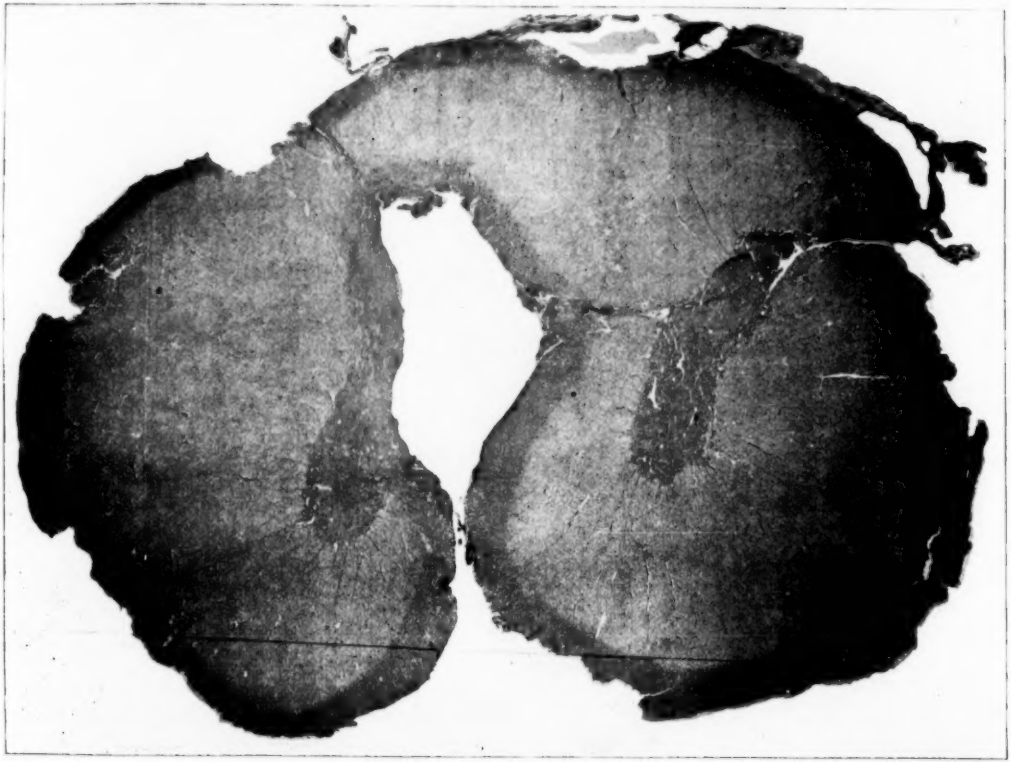

PLATE VI.

Cervical cord. Photoxylin section stained with hæmatoxylin and eosin. Shows a very large cavity (syringomyelia) involving a large part of the grey matter on one side, and extending right out to the periphery posteriorly. The black dots and dark line in the neck of the cavity are diseased vessels. (*See Plate VII.*) × 10.

former presented a fairly natural appearance throughout, with the exception of the periphery, where the normal differentiation of the fibres was lost, and indications of loss of the nerve fibres were numerous. The latter showed faint indications of a normal appearance at their deeper part, and here and there throughout, but the general appearance was that of a diffuse fine overgrowth of the interstitial tissue with degeneration and disappearance of the nerve fibres. As indicated under the description of the naked eye appearances, there was much actual loss of the nerve fibres in the superficial part of these columns.

Examination with a higher power merely intensified the picture. The walls of the vessels — arterioles and capillaries — showed pronounced hyaline and fibroid thickening, many vessels in the posterior columns being apparently obliterated. Plate IV. shows one of the many diseased vessels at the margin of the softened area in the posterior columns. While the vascular disease was far more pronounced in the posterior part of the cord, it was manifest in the other columns, and also in the grey matter.

The Weigert-Pal method showed pronounced degeneration of the fibres in the posterior columns, also slight changes in the lateral and anterior, more particularly at the periphery. The methyl-violet method showed that there was little or no true neuroglial sclerosis. The appearance of sclerosis previously suggested was mainly due to loss of nerve fibres and condensation of the supporting tissues.

Dorsal Cord.—The vascular changes were here much less pronounced, but were still easily distinguished, especially in the posterior part of the cord.

A marginal rarefaction of nerve fibres was present, being especially marked near the exit of the posterior nerve roots, where many fibres had apparently disappeared.

The Marchi method showed marked degeneration in the posterior columns (see Plate V.), and, in addition, many scattered degenerated fibres throughout the remainder of the cord, especially in the lateral column.

The methyl-violet method showed a very marked granularity in the posterior columns, most marked beside the exit of the nerve roots; this appearance closely resembled that seen in early cases of tabes in the human subject, and is possibly due to the imperfect removal of the end products of metabolism from the affected tissues, and their accumulation in the local lymphatics.

By the Toluidin blue method a few of the cells in the anterior cornua were found to be atrophied or degenerated, but the changes were inconsiderable.

Cervical Cord.—Plate VI. illustrates well some of the main features. There was a very large cavity in the grey matter of one side, extending posteriorly right out to the periphery. Its wall was composed of neuroglial tissue. In the lumen of the neck of the cavity lay a vessel with enormously thickened walls (see Plate VII.). This vessel, like many other smaller ones, was doubtless impervious. The vascular disease was much more pronounced than in the dorsal area. The degeneration of the fibres of the posterior columns was very marked.

In other sections small areas of softening could be seen, and sometimes alongside of them the diseased vessel which was obviously responsible for the condition.

Summary of findings in the Cord.—i. Extensive vascular disease most pronounced in the lumbar area, very marked in the cervical region, and present, although in much less degree, in the dorsal area. This vascular disease was invariably most advanced in the posterior columns and in the neighbourhood of the exit of the posterior nerve roots; the changes consisted in hyaline and fibroid thickening of the capillaries and larger vessels, often apparently having led to complete obliteration of the lumen of the vessel (see Plate IV.).

ii. A cavity in the anterior horn of grey matter in the lumbar region; the extent was not determined, but was probably considerable (see Plate III.).

Cervical cord. Photoxylin section stained with hæmatoxylin and eosin. Shows a very large cavity (syringomyelia) involving a large part of the grey matter on one side, and extending right out to the periphery posteriorly. The black dots and dark line in the neck of the cavity are diseased vessels. (*See Plate VII.*) × 10.

iii. Softening and disappearance of the nerve fibres in the superficial part of the posterior columns (Plate III.); many of the deeper fibres had also disappeared and others were degenerated. Degenerated fibres were also seen in other columns, more especially the lateral. There was very little, if any, true neuroglial overgrowth.

iv. The dorsal cord showed marked ascending degeneration, very marked in the posterior columns, but not limited to them. Degenerated fibres were visible over the whole field, more especially in the lateral columns (Plate V.).

v. The cervical cord suggested syringomyelia (see Plate VI.).

It should also be stated that, in addition to the above lesions, all the sections presented an appearance of rarefaction of the nerve fibres at the periphery of the cord, usually most strikingly manifested near the exit of the nerve roots. I am inclined to regard this condition not as normal, nor as dependent on defects in the method of examination, but as one due to a disorder of nutrition in association with disease of the marginal capillaries.

With regard to the conclusions to be drawn from the foregoing, there can be, I think, no doubt whatever that the vascular lesions were the primary, and the involvement of the neurons the secondary occurrence. While the degeneration of the nerve fibres was considerable, it was slight compared to the severity of the vascular disease. Indeed, one was impressed by the apparent remarkable vitality of the nerve fibres in the poor circumstances in which they lived. A further conclusion is suggested. A study of the illustrations and record shows that the vascular disease was most pronounced in the posterior part of the cord. It is advisable to have further records of these and allied conditions to determine whether this is invariably so, as it would indicate that the vessels in the posterior part of the cord are naturally more susceptible to the influence of various toxines. If the facts of this case are further established, the way is paved for the investigation of the cause of this greater liability.

CASE II.

Hackney Stallion æt. eighteen months.—Within a few days of the discovery of the previous case, and before the diagnosis was verified, I received a note from Mr. M'Callum, M.R.C.V.S., stating that a young colt could be seen at Liberton, near Edinburgh, affected with "a jink in the back," and "out in the stifles," and that it was under orders to be destroyed. Mr. M'Callum later informed me that the animal was a slight "shiverer." On examination I found a well-bred, well-nourished hackney, æt. eighteen months, 14½ hands. A cursory glance revealed nothing abnormal. Seen from a little distance off, he seemed to walk, trot, and gallop in really good style, but a closer examination revealed defects fairly similar to those noted in the former case, only lesser in degree. Two further points were observed: The involvement of the stifle joints was very slight, and there was no indication of fluid, or of the unnatural mobility of the patella noted in the previous case; and there was apparently greater weakness in the fore limbs. This last point is doubtful as the other horse did not admit of equally satisfactory examination. There were no reflex spasmodic movements at the time of my examination. A review of the clinical features led me to conclude that there was a lesion of the cord, most

PLATE VII.

Higher power view of the vessels referred to in Plate VI. It shows very advanced fibroid and hyaline degenerations of these vessels,—one in longitudinal and two in transverse sections. The former is apparently the vessel whose obliteration has been followed by the cavity formation. × 170.

marked in the posterior columns, of a nature akin to Friedreich's Ataxia in the human subject. I later ascertained the following clinical facts:—

The sire and dam are alive and well, and no facts of importance have been obtained regarding their history. The colt was wintered in the country, grazing all day and under cover at night. He got two feeds of oats per diem, and a feed of oat straw once a day in addition to the grass. It was observed that he did not thrive; he "wintered badly." The régime mentioned continued for six months, and in spring he was brought into Edinburgh, walking the distance of 17 miles. He was now put to grass, and within a week there was a material improvement in his condition. He now apparently began to thrive. In the course of the summer the owner's attention was attracted by the awkwardness in movement. No facts are obtainable as to the exact date of its onset.

The histological investigation is not completed, but the evidence already obtained shows that the diagnosis was accurate. My reason for referring to this case lies in the facts of nutrition—or rather malnutrition—just mentioned. The diet mentioned is a markedly unphysiological one. I would refer to another point of practical importance. The whole bony system was remarkably voluminous and dense, but the stifle joints were in no way involved as in the previous case. The capsule was apparently of normal thickness, and only a little unduly lax. The appearances which had given rise to the opinion that the joints were slightly involved were probably mainly due to loss of muscular tone in the muscles influencing the joint. The anatomical peculiarities of this joint in the horse probably lend themselves to this deception.

DIAGNOSIS OR DIFFERENTIAL DIAGNOSIS.

It may be useful to give a short note under this heading.

Motor weakness, if dependent on disease of the central nervous system, is due to a lesion of the grey matter or of the descending motor tracts. If in the former site, the paresis or paralysis will be of a flaccid nature and accompanied by muscular atrophy; if in the latter, a spastic element will be present. Combined lesions, however, are extremely common, and indeed they are the rule and not the exception. It must of course be borne in mind that the lesions may be in the brain, but in all probability such brain lesions are relatively less common than in the human subject. The site and nature of the muscular paralysis is therefore of the greatest importance in diagnosis.

Sensory Aberrations.—Apart from the examination of the muscular sense implied in testing co-ordination, a satisfactory clinical examination of the various sensibilities is practically impossible. The pin-pricks employed by MM. Hendrickx and Lienaux hardly be regarded as a test for tactile sensibility, but they are useful as a record of the pain sense. But I think it might be possible in some cases to arrive at a general opinion as to tactile sensibility.

Co-ordination Tests.—The general movements on which most stress should be laid are backing, sharp turning, and going on uneven ground. In the last it may be evident that the animal is frequently "recovering himself," more or less awkwardly, from his "mistakes." Further information is obtained by testing the animal when his head is covered. Under these circumstances the animal is at once made more dependent on his

muscular sense for the maintenance of equilibrium, &c., and if that sense be impaired, all the symptoms may at once become more pronounced. In aggravated cases he will fall to the ground.

Reflexes.—The state of the organic reflexes, especially bladder and rectum, should be carefully investigated. It is more than probable that accurate observation of a number of cases would reveal some disturbance in these functions. The leading symptoms would be indications of imperfect control over the evacuation, dribbling, retention, &c.

Other reflex movements are best investigated by looking for any indication of reflex spasm of different muscles, when neighbouring ones are called into action. An example of this is well seen in the case of a "shiverer;" in addition to the muscles of the limbs and trunk, the muscles of the tail are commonly involved. Smaller muscles, *e.g.*, in the lips, are occasionally affected.

Collateral evidence may be found in special symptoms, *e.g.*, the failure of the pupil to react to light. The previous history of the subject may yield important evidence; the nature of his work and the degree of exposure may also furnish a clue.

Care must be taken not to lay too much stress on occurrences at or immediately preceding the time of onset of symptoms, to the exclusion of the previous history and condition of the animal. Very frequently too much importance is attached to an accident which was in reality merely "the last straw." In seeking later to interpret the nature of the lesion from a study of the whole clinical course, we must bear in mind that the vascular lesions of the cord are numerous, and often of a temporary nature. Hæmorrhage and thrombosis are the most serious, and one or other of these is probably responsible for many cases with an acute onset. But anæmia is of equal importance. My attention has just been drawn to a short clinical note in *The Veterinarian* of February of this year—"Note on Locomotor Ataxy in the Horse." The description of the clinical features there given is hardly adequate to warrant a definite opinion as to the nature of the lesion, but enough is indicated to show that the case cannot be regarded as one of locomotor ataxy. From the short description given as to the acute onset of the symptoms, &c., one would be inclined to look to hæmorrhage or thrombosis in the cord (here also involving mainly the posterior part) for an explanation.

REMARKS.

It is convenient to consider first the purely veterinary aspects. Certain diseases whose clinical features are fairly well known, but whose etiology and pathology are still undetermined, have been incidentally referred to in the course of the paper, and the results of the examination of this case furnish, at any rate, a clue to the nature of some of these affections. The disorders referred to include those familiarly known as "jinked back," "out in the stifles," shivering (immobilité) and stringhalt. This paper deals more particularly with the first two of these in combination. I have referred to the others as their clinical features lead me to associate them with disease in adjacent parts of the cord. More particularly is this the case with shivering; the symptoms in minor cases of stringhalt can be more readily associated with other lesions outside the cord. Regarding the joint affection in the present case, I can imagine some of my readers ques-

tioning the diagnosis, as they may limit the term to those traumatic cases in which the dislocation of the patella interferes with movement to an extent not present in this case. I must leave the point, however, to be determined by veterinarians.

All the conditions just mentioned appear to have been very little studied, and the few opinions expressed reveal some confusion of ideas on the clinical symptoms. I have been unable to find any description of the bilateral joint affection. Some authorities hold that the clinical features are due to strain of the psoas muscles. To quote from Williams:—"Sprain of the psoæ muscles simulates paralysis, broken back, and that mysterious disease erroneously termed hysteria. . . . Much confusion prevails among veterinary surgeons as to the proper diagnosis of this injury; some classify all cases of inability or paralysis of the hind limbs, unless broken back can be detected, as sprain of the psoæ muscles, whilst others deny the existence of such an injury." I do not know of any pathological observations on the subject, but in the present case nothing was found to warrant the opinion that any such lesion had existed. I may add that I have investigated the point in other two cases with a like negative result, and am inclined to believe that undue stress is laid on it as a factor of etiological significance.

Again to quote from Williams: "It has been already pointed out that diseases of the spinal bones are present during life without any very decided external manifestations, and from this it may be inferred that such diseases as stringhalt, shivering, and that form of partial paralysis vulgarly termed 'jinked back,' are all probably due to some disease of the sensory tract of the spinal cord, similar to the locomotor ataxia of the human patient." The present record proves the existence of a relationship, but it is erroneous to regard three such diverse diseases as dependent on a lesion of one and the same part of the cord. As previously indicated, I am inclined to the belief that "shiverers" are comparable to cases of disseminate sclerosis, and, but with more reservation, that stringhalt is comparable to lateral sclerosis in the human subject. The subject of this paper was a good illustration of the form of nerve and muscle paralysis known as "jinked back," and he had the peculiar joint lesions which we are, I think, justified in regarding as neurotrophic in origin. (It is impossible, even if it were here advisable, to enter into a discussion of the nature of these "neurotrophic" affections.) But, as we have seen, he had other distinguishing features. In diagnosing these nervous lesions in the horse, especially when slight in degree, one must of course be careful not to lay too much stress on the presence of any one symptom, of which there are not a few that are probably capable of interpretation in other ways.

Are we really to regard this case (Case 1) as analogous to locomotor ataxia in the human subject? It resembles it in being a chronic affection of the spinal cord, involving mainly the posterior columns, with associated neurotrophic joint disorders, and this association is a very suggestive one. On reference to various standard neurological works, very little, if anything, will be found to justify the opinion that the early lesions in locomotor ataxia in the human subject, as seen by naked eye, are in the least degree similar to those here described.

I can only say that in the only case of early locomotor ataxia—carefully observed and accurately recorded during life—that I have had the opportunity of examining pathologically (within thirteen months of onset

of symptoms) the appearances in the lumbar cord were practically identical with those here described.

But further evidence is desirable before a definite conclusion is arrived at, and, as opportunities for observing the nature of the pathological process in man in its early stages are extremely rare, we must look to the veterinary profession for material assistance in its determination.

A short reference may now be made to a more practical aspect of the subject. Has this record any value to the practical veterinarian? I believe so. I am inclined to regard these cases as affections of the spinal cord due primarily to vascular disease in the affected areas, this disease—a hyaline and fibroid change leading to narrowing obliteration, and sometimes dilatation of the lumen, and thrombosis—being caused by chronic auto-intoxication from the circulation of toxic substances derived from faulty metabolism in the digestive tract or in the tissues generally. The primary error in many cases is probably to be found in an excessively nitrogenous diet, or in one in which there are other indications of defects in the relative proportions of nitrogenous, carbonaceous, and alkaline foods, and in this connection great stress must be laid on the diet in early life. It is certain that in animals, as in man, the vitality of the tissues is profoundly influenced by the impressions received in the early and growing period of life. The case of the hackney may be taken to further illustrate this point. I have little doubt that his faulty dietary was a most important factor in the causation of his disease. The fact that another colt of the same age grew up apparently well and strong under the same dietetic and other conditions, must not be taken to indicate that the subject was not prejudicially affected by the feeding; it merely proves that the said animal possessed a greater power of resistance to the action of those toxic substances to which I have referred.[1] The treatment of these cases is therefore preventive; more attention must be paid to the diet, especially in young animals. These nervous diseases, commonly so-called, can only be cured in their early stages, and it is probably more correct to speak of them as being arrested. Where actual destructive change has occurred, cure is impossible; we are then confronted not so much with the disease as with its local results.

Finally, some reference may be made to the special interest of these cases to medical practitioners.

The present record is at once a suggestion and a plea. It suggests some points of great interest in the etiology of chronic nervous diseases in the human subject. At the present time, the most eminent authorities are almost unanimous in regarding the vascular changes in these diseases as secondary occurrences, the initial lesions being of the nature of primary degenerations of the neurons. It is obviously of great importance that the point be definitely determined, and a study of comparative pathology and medicine will do much to this end. What is desired is a series of cases examined with a mind unbiassed in either direction. A study of the present cases leads the writer to the conclusion that the part played by vascular disease is a much more important one than is commonly believed.

An admirable critical *resumé* of the views at present held on this subject is found in a paper by J. Soury, "Anatomie et Physiologie pathologiques du tabes," in the *Archives de Neurologie*, Février 1901. In it there is no reference to vascular disease nor to the possibility of the condi-

[1] I have since learned that this colt died, as the result of a simple operation performed under favourable circumstances by a surgeon of special knowledge and experience.

tion being due to a general disorder of nutrition. He sums up by expressing the view, now shared by many, that the disease is no longer to be regarded as an affection of the posterior columns, nor even of the spinal cord, but of the whole nervous system. If the views [1] put forward in the present paper be substantiated by further investigations, they will, I think, indicate that the disease is to be regarded as a general derangement of nutrition rather than a primary affection of the nervous system, the lesions in the cord being local expressions of the general disorder. These points are mentioned in justification of the plea for further accurate records of similar cases.

Post-mortem examination should be made as soon as possible after death. Tissues should be preserved in formalin, 5 per cent. solution. While the cord is the most important part, it is advisable, where possible, to examine the abdominal and thoracic viscera—more particularly the kidneys, digestive tract including liver, and bone marrow. No conclusion should be arrived at as to the merely secondary importance of slight visceral changes until all the necessary facts have been carefully reviewed. Care must also be taken not to lay too much stress on the presence of bacteria of different kinds. What it is frequently desirable to know is not so much the existence of bacteria as the nature of the derangement which has led to their presence. I will be glad to undertake the examination of pieces of the cord from cases that are likely to throw light on the questions raised in the paper, and to give further information to any specially interested in the subject.

In conclusion, I must express my indebtedness to Mrs. Chalmers Watson, M.D., for much assistance in the investigation; also to the Directors of the Laboratory of the Scottish Asylums for permission to carry out the research in their laboratory, and very specially to Dr. Ford Robertson, the Superintendent, for invaluable assistance both in the selection of staining methods and in the interpretation of the results.

Veterinary Text-Books consulted.—Friedberger and Fröhne, 1900; Möller, 1895; Cadiot, 1900; Williams, 1895.

ON DISINFECTION.

BY W. LESLIE MACKENZIE, M.A., M.D., D.P.H., LATE MEDICAL OFFICER OF HEALTH FOR THE BURGH OF LEITH.

(*Continued from page* 108.)

2. *In Solution—Formalin* (*water*), *holzin* (*alcohol*).—That the disinfective potential of formalin (that is 35 to 40 per cent. solution of formaldehyde) stands very high is now beyond dispute. Blum, Vanderlinder and Burk, and Strehl are the only investigators whose results are not favourable. But Blum admits that "weak solutions suffice to prevent fermentation with gradual destruction of the bacteria."[2] The evidence on the

[1] In order to avoid any misconception as to the views here expressed, I may say that it is by no means intended to lay the whole responsibility on vascular disease. We must ever keep clearly in view the natural power of resistance of the neuron as of other cell units in the body. We must further seek to ascertain the extent to which that natural power of resistance has been prejudicially influenced by the incidence into the tissues of any external toxic agent, of a specific or other nature.

[2] Maine Report, 1896-97, p. 235.

other side is overwhelming. Mosso and Paoletti find "that 1 part in 20,000 slows the ammoniacal fermentation of urine, and that 1 in 4000 inhibits it entirely. . . . Walter states that a solution of formalin, 1 in 10,000, prevents the growth of the bacilli of anthrax, cholera, typhoid, diphtheria, and of the *Staphylococcus pyogenes aureus*. . . . In 1 per cent. solution it kills a pure culture of almost any pathogenic micro-organisms in thirty minutes. In 3 per cent. solution it kills anthrax bacillus in fifteen minutes, and all other pathogenic micro-organisms in one minute."[1] Walter also found that fæcal matter was almost instantaneously deodorised by a 1 per cent. solution, and sterilised in ten minutes with 10 per cent. solutions. Philipp found that "with formalin anthrax bacilli were killed in fifteen minutes with a 10 per cent. solution, and anthrax spores capable of withstanding action of steam at 100° C. twelve minutes were destroyed in less than five hours with a 10 per cent. solution. With a 5 per cent. solution, diphtheria bacillus was destroyed in ten minutes, anthrax bacillus in fifteen minutes, *Staphylococcus aureus* in thirty minutes, and anthrax spores in five hours."[2] Even some that doubt the efficiency of the free gas in dust-disinfection acknowledge the efficiency of the solution. Thus, Professor Sims Woodhead: "From what one knew of its action in solution, there can be no doubt that formic aldehyde or formalin was an exceedingly powerful disinfectant."[3] Dr. Blaxall is reported to have sterilised milk by a solution of one part formalin in 500 milk. Probably some organisms are much more susceptible to this disinfectant than others. This would explain the slight discrepancies recorded. Then, in confirmation of its disinfective potential, formalin is a powerful deodorant. Any one that doubts this may relieve his doubts by sprinkling a few drops of formalin in a lobby or room that smells of "cats." The "cats'" smell is almost as pervasive and persistent as musk, to which the odoriferous agent may be allied; yet, in a very short time, the odour yields before formalin. "Aronson says that formaldehyde combines readily with nearly all ill-smelling compounds, as hydrogen-sulphide, mercaptan, and ammonia, forming others that are non-offensive."[4]

These are only some striking selections from a vast mass of evidence. They are enough to justify the inference that if the pathogenic organisms are subjected for a sufficient time to a sufficiently strong solution of formalin, the result will be disinfection. The strength of solution is limited by considerations of practice. I have used for ships, and for some rooms, a 10 per cent. solution. But when this is sprayed, the operators cannot long occupy the room. When, however, rooms or forecastles are small, the operators can stand near the door; they can begin at the distal parts first, and retreat gradually. For routine purposes, I use a solution of formalin 1 part, and water 40 parts; that is, formalin 4 ounces, water 1 gallon. This, however, is qualified by one fact. To prevent the polymerisation of formaldehyde in the original formalin, I add to each gallon bottle about 5 ounces of glycerine. This prevents any precipitate. It also results in making the solution dry more slowly. This means that the gas is longer retained in the solution; for, as can easily be shown, formaldehyde is very readily absorbed by moisture, and therefore, of course, is long retained by

[1] *Zeit. für Hygiene*, April 1876, summarised in *Medical Annual*, 1897, p. 40.
[2] *Centr. für Bak.*, xvii. 499, 1895; in Maine Report, p. 236.
[3] *Journ. of San. Instit.*, vol. xviii. p. 420.
[4] Maine Report, p. 237.

it. This secures longer exposure of the wall dust to the action of the gas. The amount of glycerine, however, is not enough to make the sprayed walls damp for any considerable time. Since I began to use glycerinated formalin, I have had no complaint either of the precipitation of the formaldehyde or of the hyper-hygroscopic effects of the glycerine. A German observer recommends spraying with "glycero-formol,"—the glycerine preventing polymerisation.

Does formaldehyde penetrate? It is important to answer this question, but it is hardly relevant to my primary topic; for penetration rather concerns clothing, mattresses, &c., than surfaces of walls and furniture, and I have shown that steam methods are the best for clothing, &c. All the same, formaldehyde does penetrate more than any other gaseous disinfectant. The vacuum principle could easily be applied to increase the penetration. It has been applied by Dr. Kinyoun.

Method of applying Disinfectants to Surfaces. — So much for the efficiency of these selected disinfectants. Many others, it is unnecessary to say, might be named, and these are in no way prejudiced by anything I have said. Like those I have selected, they must go by the scientific evidence they can produce, and many of them can produce much evidence. The matter I am mainly concerned with is, given an efficient disinfectant, how shall we apply it efficiently to the surfaces of a room and of its contents. There is a long distance between the exact conditions of experiment and the rough conditions realisable within the limits of possible practice. But the distance has to be bridged, and the following are four good methods of bridging it. Personally, I prefer the last of the four, because, in my experience, I have found it best fulfil the three conditions I have found of most importance in the evolution of the disinfective organ of the public health service. The three conditions are: simplicity, rapidity, and cheapness. Its efficiency I consider equal to any of the others.

1. *Disinfection by Free Gas.*—Here I consider only the methods of applying formaldehyde. The only other gas that deserves further discussion is chlorine, and that is best applied—not as a gas, but as a solution—by brush, shower, or spray.

In all forms of disinfection by a free gas, the object is two-fold; first, to disinfect the air—a useless labour; second, to disinfect the surfaces of room and furnishings. To secure the second object, it is essential to fill the cubic content of the room with the gas. To do this, it is necessary to prevent the escape of the gas by blocking of outlets. Here is the great practical difficulty. To stop the outlets even of a fairly well-built modern room is a matter of patient and detailed labour. The major outlets—windows and fire-places—can be dealt with easily; the innumerable minute outlets only with very great difficulty. In dilapidated or ill-constructed rooms the stoppage of outlets is frequently impossible, yet such are frequently the houses demanding most thorough disinfection. In Professor Delépine's experimental room, the necessary conditions were secured. In the rooms described by Messrs. Robinson and Bryant, similar care was taken to prevent rapid dispersion of the gas. With formaldehyde, however, the rapidity of dispersion is less than with gases whose density is nearer the density of the air. Yet even with formaldehyde, the stoppage of outlets is essential to the concentration necessary for disinfection. For my own part, I consider that the stopping of outlets—or inlets—is a matter of considerable

skill; it is also a matter of considerable time; it is rarely a matter of simplicity. Doubtless it *can* be done; but the doing of it adds to the bother of the disinfection. But let it be distinctly understood that to attempt formaldehyde disinfection without the stoppage of outlets, is to reduce it to the same level of farcical facility as sulphur-fumigation frequently—not, of course, always—falls to. Let us, however, assume the stopped outlets.

(*A*) *Evaporation of Formalin*—(*a*) *Sheet Evaporation.*—To hang in the room sheets soaked in formalin is a simple method, and probably may be made adequate. But there ensues a great waste of formalin, for there is left a polymeric residue. This may be re-utilised by exposure to heat, or reconverted into formaldehyde by hot water; but to the extent that it is polymerised it is for the time inert. For the disinfection of small articles or delicate fabrics, however, the sheet method is good and useful—that is, the amount of formaldehyde communicated to the fabrics is sufficient for disinfection, but for room disinfection proper it may be discarded.

(*b*) *Heat Evaporation.*—To prevent polymerisation during evaporation, several pieces of apparatus have been constructed. Trillat's is designed to evaporate, under pressure, a combination of calcium chloride and formaldehyde. In practice, the objections to his apparatus outweigh, in my opinion, its advantages. And there is evidence to prove that "the polymerisation of formalin while undergoing distillation is largely a myth."[1] "If rapidly distilled, polymerisation rarely occurs."[2] Novy has designed a vessel for such rapid distillation. "A good Bunsen burner will distil 5 ounces of formalin, the amount necessary per 1000 cubic feet, within ten or fifteen minutes. Should there be a tendency of the formalin to polymerise, it can be prevented by the addition of 5 or 10 grains of borax."[3] Definite results are not given, but they seem to have been good. Provided, therefore, the conditions are such as to insure the necessary concentration, the evaporation of formalin will give sufficient formaldehyde. The vaporisation of "paraform" may be mentioned under this head. It is really a repolymerisation of formaldehyde.

(*c*) *Formogenic Apparatus.*—Formaldehyde may be directly generated from methylic alcohol. The apparatus used by Professor Delépine was the Formogène Richard. Others are, the Moffat generator and Bowdoin generator, and there are still others.

Of all generators tested by the American investigators, one thing was true: "Of all the forms of apparatus tested, none of them can be relied upon to sterilise free surfaces in five hours with the amount of material advocated by their different manufacturers. . . . None of them came up to the standard claimed for them."[4]

(*d*) *Temperature, Dampness of Objects, &c.*—Temperature is of some consequence. The higher the temperature, the more rapid the disinfection. But the variation in efficacy is not great between 50° F. and 80° F. (room temperature). Dampness of walls is also of some importance. Professor Robinson says that "dampness is a disadvantage, as it absorbs more or less of the gas and holds the odour in the rooms."[5] But "Novy found that infectious material is much more readily disinfected when it is moist. Even wet spore material is thoroughly disinfected by formaldehyde, whereas such material is not affected by sulphur. He found that the walls and

[1] Novy, Maine Report, p. 239; *Medical News*, lxxii., p. 641, 1898.
[2] *Ibid.*
[3] *Ibid.*
[4] Maine Report, p. 153.
[5] *Ibid.*, p. 242.

floor of the room to be disinfected, and whatever articles are present (previously spread out as much as possible), should be sprayed with water before exposure to formaldehyde vapour. Owing to the great solubility of formaldehyde, large vessels of water should not be kept in the room to be disinfected. When water is thus kept in the room, scarcely any odour of formalin will remain at the end of twenty hours, whereas, in the absence of such water, the odour at the end of the time mentioned will be intolerable."[1]

A reasonable deduction from these physical peculiarities of formaldehyde is that the ends of the free-gas method are well attained when the gas is dissolved up by the moisture on the walls or objects. But this is only another way of saying that a solution of the gas applied to the walls is an efficient method of disinfection. If this is so, would it not be less roundabout to squirt, or shower, or brush, or spray the solution directly on? Is it not probable that, since the solution can be first graded to a more than sufficient strength, the direct application of it to the walls will be *a fortiori* more reliable than the application of water and gas separately? In fact, the results with the free gas are a most powerful confirmation of the methods where the solution is applied directly—that is, of the brush, or shower, or spray.

Before passing to these, I may note that the results obtained when the formogenic lamps were used to fill an air-tight bag containing infected clothing were excellent. Indeed, we here have a method that, for disinfection of clothing, might become almost a perfect substitute for steam. To secure penetration, it might be possible to arrange an application of the aspiration pump. Dr. Kinyoun has devised a metallic "disinfecting chamber to which is attached a vacuum apparatus, a small boiler in which formaldehyde is generated by volatilisation from a mixture of formalin and calcium chloride, and a second small boiler from which ammonia is turned into the disinfecting chamber by the evaporation of ammonia water."[2] These appliances are still in the experimental stage, but the non-spoiling of fabrics is a strong point in their favour.

2. *Disinfection by Moist Brushing or Rubbing.*—Of the efficacy of brushing or rubbing with disinfective solutions, there is no question. Professor Delépine's results are decisive. In many towns no objection is taken to the method. But it is admitted that such a method involves the spoiling of wall papers. It is also very laborious. Except for special cases, therefore, the method seems to me loaded with disadvantages. With any of the solutions I have discussed, brushing may be made effective; the mechanical action counts for something. But, after all, the essence of the matter is the wetting of infectious material with a sufficiently strong disinfective solution. This can be done by shower or spray with sufficient mechanical force to insure thorough wetting, yet without any destruction of the paper, except when the disinfectant has chemical effects on the colour. These effects, as I have already stated, are among the disadvantages of the hypochlorites. With solutions of formalin, as I have shown elsewhere, there is no destruction of paper and no interference with colours. In very soft papers, occasionally there may be some "running;" but after four years of formalin, I have not had one complaint of destroyed papers.

3. *Disinfection by Jet or Shower.*—Here again the purpose is to wet thoroughly the surfaces to be disinfected. This, like spraying, can also be

[1] Maine Report, p. 242. [2] *Ibid.*, p. 239.

done without destruction of papers. With suitable appliances, it could be made simple, rapid, and cheap. There must be a certain extravagance in the amount of liquid used, but this is no great objection. In jetting or showering with formalin, there is the double advantage of a solution and a gas. The "messing" due to the wetting of floors is, if kept short of "damages" point, an advantage; it compels the housekeeper, for the sake of comfort, to clean up. The same is true of the spray.

4. *Disinfection by Spray.*—(*a*) *General Results.*—In the *Sanitary Jonrnal* for March 1897 I gave some account of the spray method. My experience since then has confirmed me in the positions there maintained. In hospital disinfection I have used the formalin spray for over four years. In general disinfection I have used it for over three years. More than 2000 houses or rooms have been sprayed. I have ceased to keep any record of the number of hospital wards disinfected. I may state generally that the spraying included cases of typhus and enteric fevers, diphtheria, small-pox—modified, discreet, confluent, and hæmorrhagic—chicken-pox, measles, scarlet fever, erysipelas, cellulitis, and anthrax. Wards occupied for six months with scarlet fever have been sprayed and then used for measles. Wards occupied for months with measles have been sprayed and used for chicken-pox; wards exposed for weeks to chicken-pox have been sprayed and used for measles. And so on. Diphtheria has been housed after scarlet fever, and scarlet fever after diphtheria; scarlet fever after whooping-cough, and whooping-cough after scarlet fever, the whole yielding a large variety of permutations and combinations. In houses second cases frequently occur within the incubation period; but, except in one or two cases where personal contact with a patient was proved, I have not had a recurrence of infection. In the hospital I have never had any cross-infection after spraying except once, and that was found to be due to an undiscovered case of scarlet fever still persisting after an outbreak due to a case of mixed diphtheria and scarlet fever infection. A considerable number of those double cases had been admitted, and one or two escaped observation, the evidences of diphtheria predominating. The result was that several diphtheria patients developed scarlet fever. One could not attribute the spread entirely to conveyance by nurses. Part of it was, in all probability, aërial. After a thorough disinfection, yet another case occurred, and this, as I have said, was due to an original case that had escaped observation. When this was removed, and the ward again sprayed, no fresh case appeared. This outbreak showed that the patients in a ward may be rapidly infected; it also shows that isolation and disinfection are efficient to stamp out such infection. The amount due to the infected room it is impossible to specify precisely; it is equally impossible to eliminate that amount altogether. More stress may be laid on the disinfection of houses and wards infected with typhus fever, small-pox, and measles. In no case have I found recurrence except within the incubation period. Further, I have noticed that after a scarlet fever pavilion has been some months in use, it begins to grow more or less unhealthy, even when kept as clean as hospital methods make possible, and that is *very* clean. One notices more swollen glands, more irritated eyes, more eczematous mouths and noses, more small abscesses, more slowly mending throats, and so on. In such circumstances I have shifted the whole camp, sprayed the pavilion, and in a few days reoccupied. The result has always been good. The known habits of microbic life in occupied rooms would lead us to

expect nothing less. The dust on hospital walls is mainly wool from the beds. These, in a scarlet fever ward, must be regarded as the most infectious articles in the ward. Consequently, in such wards, the persistence of streptococcus or staphylococcus, in some form, is almost normal. These organisms must be kept in check. To them many of the minor ailments I have referred to are doubtless due. Under the formalin spray such ailments vanish. The pre-Listerian experiences of hospitalism are only too ready to repeat themselves; but the repetition is now inexcusable, for hospitals can be so constructed as to make cleansing and disinfection easy.

These large effects are among the best confirmations of the efficiency of any method. They are less definite in detail than the results of laboratory experiment; but they are equally impressive in the mass. I could add many other groups of facts; for example, an outbreak of measles in a scarlet fever ward (owing to an imported case), shifting of the camp, spraying, reoccupation without occurrence of fresh cases. Such isolated groups have little value by themselves. They must be taken as part of a sustained experience. When the facts are of a well-understood order, as when a surgical wound is nursed in an erysipelas ward, they fall in with the great body of experiences that form the scientific basis of aseptic surgery. More than once I have nursed a tracheotomy case in a ward sprayed after being recently occupied by an erysipelas case. Such exposures, however, have been, in my own experience, too few to found any negative proposition upon them. At the same time, every surgeon knows the susceptibility of open wounds in an erysipelas ward, and the treachery of erysipelas once it enters a surgical ward. On one occasion a surgical ward in a general hospital had somehow become infected; two or three fresh cases occurred. The ward was fumigated with sulphur, and the usual measures taken with floors and beds, but cases continued to recur. It was then sprayed, and correspondingly radical measures were taken with beds, utensils, &c. No fresh cases occurred. Here the spraying was only a part of the general sterilisation; but it was the greatest part so far as the ward itself was concerned.

These facts, and such as these—the changes rung on infected wards, the interchange of diseases carried out as nearly as possible on the principles of aseptic surgery, the vanishing of minor ward ailments, the sweetening of houses—have combined to confirm not only the masses of evidence in favour of the high potency of formalin as a disinfectant, but also the particular method of applying it to infected areas.

(*B*) *Some Practical Points*—(*a*) *Time of Exposure.*—An important point to settle is—How long does any dust on a wall remain exposed to the disinfectant applied? If corrosive sublimate is the disinfectant used, one minute is sufficient to disinfect non-sporing germs, and five minutes, or thereby, to disinfect anthrax spores. If formalin is used, in 2 per cent. solution, I should say that at least five minutes' exposure ought to be secured; but, if possible, half an hour, or an hour, or longer. Now, with the spray, I have found as follows: *First*, a varnished wooden wall of a hospital was sprayed on a frosty day. The temperature of the ward was about 40° F. The drops of liquid remained quite visible, and on rubbing with the finger the surface was found quite moist at the end of four and a half hours. This was several times repeated. *Second*, in a hospital ward, with impervious walls, the wall remained moist for one and three-quarter

hours, although the part was exposed to a mild sun shining through a window. In the shade the same wall remained moist for at least three hours. *Third*, I have made no exact observations on papered walls; but here the capillarity of the paper plays a part. The effect is the same as when a paper is soaked in a disinfectant. The rate of drying depends on the temperature and the amount of water-vapour. This, in a recently sprayed room, is necessarily great; evaporation is consequently slowed down, and, in every case, one may be reasonably certain that the time of exposure will not be less than half an hour to an hour. From rough observation, I am inclined to regard the time of drying as much longer. But other tests are available with formalin. For, so long as any gaseous smell remains, formalin is being given off from the walls. Now, I have sometimes found a strong smell of formalin in a sprayed room at the end of twenty-four hours. In the hospital first named, when the temperature was low, the disinfectors found that a ward sprayed on one afternoon was almost intolerable next forenoon—a period of eighteen hours, and this without any special effort to retain the gas. In warm rooms, where a fire is active, the smell, intolerable at first, vanishes rapidly, but it is usually powerful even at the end of four or five hours, unless special measures have been taken to ventilate. The persistence of the smell indicates that the formalin on the walls is still active. And, with papered or sized walls, the absorption of the liquid secures its better diffusion. Spraying becomes a soaking. I should add that, with formalin, the spray acts not only as a moistener, but also as a fumigator. It applies the dissolved gas in the first instance to the most important surfaces, but, thereafter, the gas is set free to penetrate the parts that the liquid may have missed. This cannot at any time be great, for a good sprayer throws a cloud of about 5 feet by 2 or 3 feet; this soon fills a room, and every globule gives up something to the atmosphere. Thus it seems to me that, while the advantages of forced application of a strong liquid are gained, the advantages of a subsequent fumigation by formaldehyde are not lost. The delicate mobility of the spray-cloud makes it applicable to any shape of room, press, closet wardrobe, or other combination of the inconveniences that fill the ordinary "furnished" bedroom. This point I mention because it has been maintained that the spray can be relied on only if every part is "religiously" wetted. Every part ought to be wetted; but the wetting is not, with formalin, the whole case. On one occasion I took some friends into the ambulance shed at East Pilton Hospital. The odour of formalin was so strong, that they had to withdraw. The ambulance had gone out an hour before; the driver had sprayed it, and the diffused formalin in the large well-ventilated shed was the remnant of the spraying.

(*b*) *Strength of Solutions.*—Of formalin, I use a solution of 1 in 40; that is, formalin 4 ounces, water 1 gallon. Recently, on account of the addition of glycerine, I have used a little over 4 ounces; in cases requiring special disinfection, 6, 7, 8, and 10 ounces to the gallon. On the basis of the facts already given, I consider that, with 1 in 30 to 40, there is ample margin for any reasonable variation in the time of exposure. For the other solutions the standard strengths would be—corrosive sublimate, 1 in 1000; hypochlorite of calcium or soda, 1 per cent.; lysol, 2 per cent.; carbolic acid with salt, 5 per cent.

(*c*) *Management of the Equifex Sprayers.*—I name these, because I am not familiar with the working of others. There are several little points of

management that make all the difference between satisfaction and dissatisfaction in the use of the spray. Perhaps I shall be well enough within my title if I detail one or two such points.

(1) *Length of Tubes.*—For convenience of working I prefer 12-feet tubes to either 8-feet or 6-feet tubes. Doubtless the labour is somewhat increased by the increased column of water; but the adaptivity of the sprayer is also increased. Where two men work the instrument—one as the pumper and the other as the dispenser—12-feet tubes increase the convenience manifold. The longer the tubes the longer the pumper may remain in one spot, and the more regularly may the dispenser work. Indeed, in small rooms the pumper barely needs to change his *locus* at all. The dispenser, on the other hand, finds it easier to manipulate the nozzle freely, and to direct it under beds, into drawers, under mattresses, behind doors, behind wardrobes, and so on. Where the roof is over 8 feet high, it is a great convenience to have over 8 feet of tubing to work with. Further, the longer tube secures a more equable production of the spray-cloud. As the arteries, by their elasticity acting against a frontal resistance, convert a pulsating into a non-pulsating current, so the more diffused elasticity of the longer tubes maintains a steadier pressure of air and water. This can be readily tested. If, after the air-pressure is high, the air and water stopcocks are both closed, the spray still continues for a considerable number of seconds. With the shorter tubes, the current stops in a second or two. Once more, the longer the tube, the thicker their walls should be. The thinner tubes readily form "aneurisms" under the pressure. Probably such high pressure is never needed, but it is apt to occur in practice. For the two-men system, longer and thicker tubes increase the convenience; for the one-man system, shorter tubes diminish the labour.

(2) *Adjustments.*—With the larger equifex instruments, where the air-pump is the only pump, there is usually no difficulty in adjustment. I hesitate to detail the extremely elementary mechanical directions for satisfactory sprayings; I should hesitate still more had I not found them sometimes beyond the skill of intelligent, but non-mechanic, workmen. To make the sprayer work properly, it is necessary to have the rubber tubes clean, unobstructed, and properly fastened; to have the air-pump well oiled both in the piston and piston-rod (I had an apparatus seriously spoiled for want of so seemingly simple a precaution); to secure that the ball-valve is acting freely; to cleanse it with benzine if necessary; to see that the tube between the air-pump and cylinder is free of grease or other obstruction (benzine being here again useful); to test the patency of the air outlet and water outlet before fastening on the rubber tubes; to test separately the air-tube and water-tube after fastening; to see that the internal nipple of the air-tube is perfectly pervious (it is apt to be choked by shreds of rubber or dirt); to examine from time to time the collared retarder of the water-tube, and to see that it is pervious; to see that the stopcocks are tight; to wash out the cylinder frequently. In the larger apparatus I have found it best to turn on the water first; then slowly to turn on the air until the necessary fineness of spray is obtained; then with slow, steady thrusts to maintain such pressure as will give the particular best "note." Every sprayer has a pitch of its own when it is at its best. The men prefer to secure this note first, and to maintain it all through the operation. Again, if the spray tends to squirt, it is occasionally because some water has passed into the air-tube. Let this be pumped clear, and a little readjustment for higher or lower levels will prevent the squirting.

With the more portable apparatus, which has two pumps, one for sucking up the water, the other for forcing in the air, adjustment is more difficult. The secret of rapid adjustment lies in the feed-pipe. The stopcock on this should be turned off until the apparatus takes up just the amount necessary to keep a constant spray. The other stopcocks should be adjusted correspondingly. I have found that the bottom nipple valve is apt to freeze on exposure in cold weather. Care is needed in thawing. I should not think of noting these trifles did I not know that they *have* given rise to difficulties. I may add that the pumping labour of the more portable spray has been found distinctly less than of the heavier, and this without impairing the extent or quality of the spray-cloud. Frequent oiling is absolutely essential in the lighter apparatus. The apparatus should be pumped empty after a day's use.

As a criticism of both appliances one may say that the heavier is needlessly heavy and clumsy; the lighter suffers from the necessity of a detached vessel for the liquid. To meet the latter point, I am adjusting a light vessel to the outside of the cylinder. Vessel and cylinder can be strapped to the pumper's leg, and thus the stability of the whole sprayer is improved.

FIVE YEARS' EXPERIENCE OF MEDIAN NEURECTOMY.[1]

BY PROFESSOR F. HOBDAY.

I DO not propose in my paper to-night to describe in detail the operation of median neurectomy; that has already been done in several of the journals more than once during the past five years. I believe I am correct in claiming that the first case operated upon in England was done at the Free Clinique of the London College on the 5th of October 1895. Previous to that the operation had been introduced into France by Pellerin in 1892, whilst the originator of the idea of severing this nerve as a cure for lameness was Peters, an assistant at the Veterinary School in Berlin, about the year 1885. With any operation, and with that of neurectomy in particular, one of the chief points to consider is the sequel. However neat an operation may be, it is of no value if it does not render a certain proportion of subjects submitted to it fit to work for a reasonable length of time afterwards.

In the case of median neurectomy I am prepared to assert that it is an exceedingly useful operation, one which has taken a firm foothold and will undoubtedly stay. It is being performed by veterinary surgeons in many parts of England, and no student has left the London College during the past four or five years without having had an opportunity of seeing the operation and its results, or of doing it himself.

The opinions I bring before you to-night are based upon a total of, approximately, 500 individual cases, the first consecutive 100 of which have been traced right up to date. The results have been excellent, particularly when one takes into consideration the character of the patients operated upon, as the majority of them were old horses whose average span of life remaining would not, in the ordinary course of things, have been more than two, three, or perhaps four years. Most of them were cab or cart horses suffering from lamenesses which the usually known methods of treatment

[1] Read at a meeting of the Central Veterinary Medical Society on January 17th.

had failed to relieve. Of course a neurectomy is never an operation to be indiscriminately advised, but in some old-standing lamenesses it affords a way by which relief may be given and the animal again made useful for certain classes of work.

Section of the median nerve has in particular an advantage over the usual double plantar operation in that its influence extends over a larger area, whilst at the same time there is less risk of sloughing of the foot owing to the supply which is still transmitted to the external plantar by the ulnar nerve. When the ulnar or the external plantar nerves are divided at the same time as the median, the risk of sloughing, as one might naturally expect, is quite as great if not greater than after the double plantar operation. According to German and French accounts about 2 per cent. is the average in which sloughing takes place after division of the median alone. Out of the first hundred consecutive cases gelatine degeneration has only ensued once, and out of the whole 500 cases I have only met with two instances. One occurred sixteen months afterwards and the other nine months. I know that degeneration and rupture of the flexor tendons is apt to occur, but I haven't yet seen it. One animal, a high-stepping pony, six years old, when operated upon on 16th November 1895, for persistent lameness due to a large splint, is still working regularly and has not been lame on that leg since. There is no deterioration in its action, and the splint for which it was operated upon has certainly become much less in size, although that might, of course, have been absorbed in any case.

Division of the median nerve caused immediate disappearance of the lameness, although blistering and the application of the pointed firing-iron had failed. This disappearance of lameness *immediately* after operation is by no means an invariable rule, as frequently there is only slight improvement at the time, but as the wound heals the animal becomes sound. I have records of ten other cases that were still working more than three years afterwards, and can find at least another dozen which have been in regular work for more than two years. Even if, as in some of the remainder of the hundred traced up to date, the animal can only be made fit for one year's more work the operation is worth doing.

With regard to the dangers in connection with the operation itself I am sure that to a careful operator they are very slight. If strict attention is paid to cleanliness and antiseptic precautions, such as shaving off the hair, thoroughly scrubbing the skin with ether or soft soap, the wound as a rule requires no further attention beyond the removal of the sutures in about ten days.

The most troublesome incident likely to occur at the time is the puncture of the large artery or vein (the latter being the most commonly done) which accompanies the nerve; it is troublesome, not because any very serious results are likely to ensue, but because the operator is apt to get flurried and the seat of operation is covered with blood. The application of a tourniquet either above or below, as the case may be, will materially assist in remedying this. I have seen the vein pricked many times and even seen it cut across; it has on one or two occasions required constant application of the tourniquet for some hours, but I have never seen any permanent harm ensue.

Similarly with the artery. I have seen this vessel cut across in mistake for the nerve on four separate occasions, but, although the legs in each case were much swollen for a week or two, and the toe was dragged for a while,

in no instance did anything more serious occur as a sequel. Slight variations in the position or branching of the median nerve are occasionally met with; we have met with several, and Professor Bradley illustrated and described an instance of this kind in THE VETERINARY JOURNAL about two years ago.

With regard to the use of an anæsthetic, although the operation can be done without, either chloroform or some local aneæsthetic ought always to be used. On humane grounds it needs no argument, and for the operator it certainly makes matters much more convenient.

It has been claimed by M. Pellerin that the presence of neuromas after median neurectomy is a rarity, but such has not been my experience. I am led to be on the look-out for them in almost, if not quite, as large a proportion of cases as those in which they occur after the plantar operation.

Like all neuromas they are often exceedingly painful and may give rise to acute lameness, whilst their removal will frequently render the patient sound again at once.

In conclusion, there are two other very important points to be thought of from the practitioners' point of view—one is the selection of suitable subjects, and the other is the method by which an animal which has been operated upon can be detected. The latter is of course of the utmost importance when considering the question of soundness. After some time has elapsed there is sometimes the greatest difficulty in deciding if the operation has been done neatly. Only a month ago a cab-owner showed me a horse which had had the median cut in each fore leg about three years ago, and nothing whatever could be detected except by the most minute search. The scar should always be looked for, and if suspected, search must be made with the end of the finger for the hole in the faschia. This is usually made out without much difficulty; it may feel like a well-defined hole, or this may be filled up by soft muscle which yields on pressure, or hard fibrous or neuromatous tissue which gives pain when pressed. It cannot, however, always be felt.

Now with regard to the selection of suitable subjects, my five years' experience leads to a confirmation of the opinion expressed in *The Journal of Comparative Pathology and Therapeutics* (Sept. 1896 and 1897, and Dec. 1898) and *The Veterinary Record* (Dec. 1896)—"For old standing lameness, when due to splints, exostosis on the inside of the leg, chronically sprained, thickened and painful perforans or perforatus tendons, or cases of that kind which cause pain by pressing on the adjacent nerve structures, after all other known methods of treatment have failed, median neurectomy is the operation which will be the most likely to give the animal a new lease of life and usefulness."

"For diseases below the fetlock joint, such as navicular, ringbone, sidebone, &c., there appears to be no advantage whatever over ordinary internal plantar neurectomy, and we have the disadvantage of having unnecessarily deprived a large part of the limb of its nerve supply."

In the treatment, however, of that form of exostosis which is so commonly met with on the inside of the leg in cab horses, division of the median nerve has given better results than division merely of the internal plantar. I have thought that probably this has been due to undetected complications in the region of the cannon bone. When mechanical interference has not given rise to a stiff joint, median neurectomy has given excellent results when the actual cautery has actually failed.

QUESTIONS AFFECTING THE PRODUCERS AND CONSUMERS OF MILK.

THE last of the Glasgow Society's lectures for the present season was delivered on Wednesday evening, 6th February, by Dr. Chalmers, Medical Officer of Health for Glasgow, his subject being "Questions mutually affecting the Producers and Consumers of Milk."

Dr. Chalmers said that, when he had the privilege formerly of taking part in their deliberations, it was not long after they had seen an extended prevalence of scarlet fever following an eruption on the teats and udders of a herd of milk cows, supplying milk to a dairy, of which all the persons attacked were customers, and where the occurrence suggested that scarlet fever in mankind might quite definitely be associated with an affection of the animal yielding the milk. On a later occasion the first Royal Comission on Tuberculosis had then just recently issued their Report, and they discussed in detail many of the interesting circumstances which that Commission had considered regarding the risk to which the consumer of the meat or milk of a tuberculous animal was exposed of contracting the seeds of the disease from which the animal suffered. On the present occasion they might not unprofitably consider another great source of the contamination of milk, and which for convenience they might call

"GERM CONTAMINATION,"

because, in the first place, it would interest them as seriously influencing the keeping quality of milk; and to the consumer it was of equal importance, because it was to be regarded as the cause of much unclassified disease, but especially of those forms which had disturbances of the digestive system as a feature, and in children at least were recognisably associated with illness that was often fatal in its termination. As preliminary, however, it might be wise to refresh their memories with some reference to those aspects of the question on which all were agreed. For years the association between milk and disease had been as definitely accepted as any other fact connected with the traffic in milk, and yet they had to admit that there remained much to do, and more to learn, before they could rest satisfied that the production and distribution of milk were as they could wish them to be. At the present time the name of the milk purveyor in a case of scarlet fever or enteric fever or diphtheria could not be safely left out of the scope of any inquiry concerning the source of these diseases. Would there ever come a time when it would cease to be of more value in the quest than that of the baker or grocer? Were they not rather adding to the list of diseases in which a knowledge of milk supplies became necessary? For, as they knew, the last Royal Commission on Tuberculosis collected evidence which quite definitely established the part played by milk in disseminating some forms of this disease. To what was all that tending? Already Local Authorities were arming themselves with legislative powers which brought the milk animal, irrespective of locality, within the purview of the authority within whose area its milk was sold, and the pasteurising of milk had come to have quite a commercial significance.

TO "PASTEURISE" MILK

was rather an attractive method for stating the need of sterilising it. Pas-

teurising under present conditions had both a place and a value, but he often wondered if the consumer of the pasteurised product reflected on the conditions which had rendered the process advisable. Pasteur in his classical experiments found that, by raising the temperature of certain fluids to about 70°, he could destroy the fully developed micro-organism—but not the spores or seedlings—and Tyndal, in developing the inquiry, found that on cooling these fluids to about the temperature of his laboratory, those spores grew into the adult form, which again required the application of a high temperature for their destruction, and by a process of alternately heating and cooling, several times repeated, the fluid became finally sterilised. Practically, he believed that no milk was sold commercially which was sterilised in this manner, alternative methods by which it was brought to a higher temperature and kept thereat for a shorter time, being usually adopted. Pasteurising thus aimed at rendering inert something in milk which was present there solely as a contamination, and, while its value need not be under-estimated, the reasons which rendered it desirable should not be forgotten. Already, as they knew, in their effort to ensure a pure supply when large consumers of milk entered the market to select a source, they made stipulations regarding the structure of premises, the health of the animals, the supervision of the workers, and other things which were part simply of a business arrangement, and were based on definitely accepted convictions regarding the dangers to which an uncontrolled trading in milk exposed the consumer. But to the individual consumer of small quantities no such stipulation was possible. He bought his milk from the nearest dairy or milk-cart in hopeless ignorance of its source, and to him, in these circumstances, the value of some domestic process of sterilising was considerable. But to many a small consumer this degree of attention to the minor details of a scientific experiment was impossible; and it was worth while considering this, for the individual consumer who was helpless was likely some day to awaken to the fact and demand a solution. On a former occasion he expressed the opinion that the milk consumer was not likely to accept pasteurisation or sterilising of the milk as his final protection against tuberculosis, when he knew that milk could be obtained absolutely free from tubercular taint. It seemed to him that to pasteurise milk was not more logical than would be a proposal to pasteurise water instead of procuring it from a pure source. Already they recognised

TWO CLASSES OF DISEASE

as liable to be associated in their dissemination with milk, one class consisting of the more commonly known infectious diseases, such as scarlet and enteric fever, and the other the mass of affections commonly called tubercular, but more particularly those forms of tuberculosis which affected the digestive track. The first class of diseases might generally be regarded as simple examples of contamination to which all milk was exposed, irrespective of the state of health of the animal from which it was obtained; while the second or tuberculous class was definitely related to disease in the animal yielding the milk—that was, to infection of the milk derived from disease in the udder. There was, however, another class of contamination to which milk was liable, and which in the future was, he thought, likely to obtain an increasing amount of attention. Milk, as secreted in

the udder of the cow, was sterile. The claim for the necessity of sterilisation was an admission that organic life had got access to the milk, and although they might admit the advantages of sterilisation, they should not forget that the need therefor carried with it an admission that contamination had reached the milk, and that their aim in sterilising was to render this inert through destroying it by heat. Having referred to the composition of milk, the lecturer went on to speak of the question of contamination. Here, if anywhere, much is required to be done, not, he thought, because the milk producer had been slow to recognise the need for preventing contamination when the possibility of this occurring in a patent form existed, but because the possibilities of contamination attended the handling of milk from its production in the byre to its consumption in the household. But contaminations in this form were frequently overlooked, because they arose from, as it were, the almost natural setting of the conditions which attend production and distribution. To fairly appreciate this, one must remember something of

THE ROLE PLAYED BY BACTERIA

in nature. Its usual association with disease was very apt to beget for bacteria generally a bad name; but to this Society it was not necessary to adduce illustrations of a quite other value and field of activity for these bacterial organisms. The flavouring of butter, the ripening of cheese, the manuring of fields, the production of crops—agriculture generally, was dependent on the activity of these organisms, carried on in the laboratory of nature, and solely for the good of man. The great work—the greatest work indeed—of bacteria was beneficial to man. They disintegrated organic matter, and resolved it into organic elements. They prevented dead and dying vegetable and animal matter from clogging the surface of the earth. Without them, indeed, life would become impossible. There were bacteria of the soil, bacteria of water, and bacteria of air, derived mostly from the soil over which it moved. In India, and in Africa more recently, they had seen widespread diffusion of enteric fever through contamination of food by air-borne infectious dust. Some of these organisms were saprophytic, or live on dead matter—these were the scavengers of nature; others were parasitic, but the division was not a sharp one, and might be wholly artificial. Anthrax, tubercle, enteric, plague (saprophy, &c.), leprosy, grew only with the greatest difficulty outslde the body in artificial culture. What was

THE SPECIAL VALUE.

to them at the moment of all that. Thus he thought that wherever dust or dirt (unless it were purely mineral, which was rare) lodged, there they had colonies of these organisms, all actively engaged in their several special forms of disintegration, so that in badly kept houses and outbuildings, in barns, in byres, in dirty milk vessels, on the hands and unwashed clothes of workers, in every soiled rag or uncleansed tub, myriads of these organisms existed, and it was safe only to assume that their functions could be exercised harmlessly when their disintegrating action was confined to material which was effete, and was not transferred to material which was afterwards to be used as food. If any one was disposed to doubt that these organisms not infrequently found their way into the general milk supply, he would ask them to explain the origin of the dust sediment which one so often found at the bottom of a glass in which milk had been standing for

any time. Analysis of that had repeatedly shown that it was largely excremental in its origin. If to this they added that milk was an excellent source of food supply for bacterial as well as mammalian life, the need for excessive care in its handling was all the more manifest.

THE HEALTH AND HOUSING OF MILK ANIMALS.

He had said little regarding the bacteria which might be added to the milk from a diseased condition of the animal itself, because they were for the moment agreed that the milk of no unhealthy animal should be used as food. It was true that each of them might interpret the condition "unhealthy" in different ways, for, in relation to tuberculosis, it was a little illogical to regard the invasion of a previously unaffected udder as insidious and possible at any time, and yet be compelled to await the actual development of disease therein before the condition was reached, which they should both regard as demanding the exclusion of the animal from a milk herd. This attitude was, he thought, however, purely tentative. On the question of housing of cattle, so much that was excellent had so recently been said by one of their own members, Mr. Speir, that for the present he did not propose to enter into a discussion of the details of cubic space, lighting, area of ventilating openings, structure of walls and floors, for, after all, the value of these did not lie in their provision, but in the use which was made of them. All of them had seen excellently devised architectural contrivances for procuring free movement of air within a byre, remain absolutely inert because the principle which they were intended to give effect to was not accepted by the owners of the animals housed therein. Herein lay

THE CRUX OF THE POSITION,

for if a Local Authority based its regulations on convictions which were not accepted by the milk producer, then even the provision of a large cubic space and of wide openings for ventilation might well become useless for attaining the object they were intended to accomplish. Could the production of milk become remunerative under conditions which aimed primarily at producing healthy animals? Was it necessary to have a certain temperature in a byre if this was only to be obtained at the expense of both light and air? The conditions which conduced to the healthy living of animals were not materially different from those which attained a similar object in man. What was the value to them of all that recent years had taught regarding the value of the open air treatment of consumption in man? It was the conviction that the conditions of healthy living in animals were not consistent with remunerative milk production that created all the difficulty which existed regarding cubic space and ventilation.

OTHER SOURCES OF CONTAMINATION.

They might leave aside the question of impurity reaching the milk from the food of the animal, because these were of another sort from those they were considering. But the animal's coat was a prolific source of contamination of milk by bacterial organisms. Here exceptional facilities for harbouring dirt and dust abound, and these, of course, were rich in bacteria. To the flanks and udders adhered all kinds of impurities on which the

animals lie, and it had been estimated that in the city of Berlin 300 lb. of excrement (obtained from this source) were consumed daily by the population in its milk supply. One often wondered why the care which was exercised in the grooming of a horse was so frequently neglected in the dairy herd. Again, in the hands and clothes of the milker sources of contamination existed, and the observance of a rule for washing the hands of the milker should be more rigidly insisted on. The provision of a suitable overall to be used only in milking, and frequently washed, would also tend to reduce the opportunities of contamination from clothing. From these illustrations of the methods of germ contamination

RULES FOR THE CONDUCT OF MILKING

might readily be constructed, and they would include—(1) removal of all dirt and loose hairs from the flanks and under parts of the animal; (2) washing with clean water, and leaving the surfaces moist only, so the remaining organism might be fixed in this position; (3) milkers' hands to be thoroughly cleansed with soap and water, and a milking jacket or overall worn during the process. In this warfare against germ contamination the most scrupulous attention to cleanliness was required, and if it implied some little trouble, the reward was, at least, immediate, for milk obtained under these conditions had better keeping qualities than when they were not observed.

EFFECT OF REDUCED TEMPERATURE.

There was one striking feature in germ life to which some reference had already been made in connection with the sterilisation of milk, viz., the effect of variation of temperature on their vitality. They had, in a very limited degree, the power of accommodating themselves to great changes in temperature. A high temperature killed them, while low temperature restrained their action. Milk, as obtained from the udder, tnok several hours to cool down to the temperature of the surrounding air. An enormous multiplication of these organisms went on during the hours which immediately followed milking, and which rapid cooling—by a stream of running cold or ice water—of the milk would prevent. This method of restraining the growth of these organisms was so simple that its addition to the ordinary processes of the dairy, might, he thought, with advantage become much more general than it was. Nor could the care which they had seen to be necessary in the production of milk be relaxed anywhere during the whole course of its distribution. It was a doctrine of cleanliness *in excelsis*, not the mere absence of dirt and gross contamination, but the production, as nearly as might be, of germ-free surroundings in the whole course of the milk stream. Two things further he would ask them to consider.

THE DAIRIES' ORDER,

as they knew, prohibited the employment in a dairy of any one suffering from infectious disease. That meant, of course, recognisable disease. But to them, who were familiar with tuberculosis in animals, it need not be said that forms of disease existed which were barely recognisable, save to a practised eye. And as with disease in animals, so was it with disease in man. Mildness in type was the shadow which haunted every one who

must, in a given example, decide whether a suspected disease was or was not present. To many of them it must have now or then come as a surprise that the tuberculin test had revealed tubercle where they barely thought it existed, if, indeed, they were not disposed to deny the meaning of the evidence which the test revealed. With this knowledge they would scarcely wonder, should the plea be more urgently pressed than formerly, for placing all workers in dairies under some kind of medical supervision, just as all animals in dairies should be under the supervision of a veterinary surgeon. Of those of them who were engaged in the work of milk distribution, he would further ask by what method did they select the

CHILDREN WHO DISTRIBUTED THE MILK?

Had they any knowledge of their habits, of the houses they came from, of the existence of disease in these houses? In conclusion, it was, he thought, a question worthy the consideration of that Society whether the consumer of milk was likely to relax his demand for a more rigidly supervised traffic. The willingness which the milk trade had always shown in meeting the fair demands of the consumer in the past bade them hope that fair effort would be made to merit them. And yet these demands must, by reason of more widely diffused knowledge, become increasingly urgent and increasingly more stringent. Milk was like nothing else in the whole range of food supply. It might be contaminated at its source; it must always be exposed to dangers of contamination in the course of its distribution. Even after it had reached the house of the consumer, every badly cleansed dish into which it was put became a source of contamination, and the domestic sweeping brush might readily enough disperse germ-laden dust, which might become potent for evil when deposited in the milk dish.

ANNUAL REPORT OF THE BENGAL VETERINARY COLLEGE AND OF THE CIVIL VETERINARY DEPARTMENT, BENGAL, FOR THE YEAR 1899-1900.

We give, even though very late in the day, the Report ordered by the Lieutenant-Governor of Bengal in the Annual Report of the Bengal Veterinary College for 1899-1900. We congratulate Veterinary-Major Raymond, and we envy the students and assistants in that part of the world, in their varied opportunities of becoming thoroughly acquainted with some of the most important diseases affecting the lower animals.

We hope and trust that some day the Council of the Royal College of Veterinary Surgeons, when determining in the application of the Queen Victoria Jubilee Fund, will take into consideration the advisability of asking supplementary aid from the Board of Agriculture in the shape of free passage to and from India, and establishing one or more travelling bursaries.

"The Annual Report of the Civil Veterinary Department of Bengal was received on the 20th of July, about fifty days later than the prescribed date. It contains a clear and brief account of the progress of the Veterinary College during the year, the development of local veterinary institutions, the history of the epidemics during the year, the experiments made with

the object of checking disease, and the attempts made to improve the local breeds of cattle.

"2. *The Veterinary College.*—The period of tuition now extends over three years, and it is satisfactory to find that all those who completed the second year course last year continued their studies. The number of new students was large also; and altogether thirty-six pupils attended the annual examination, the results of which were very creditable to the Principal and tutors. Last year there were no Muhammadans in the College, but no less than five have now completed the first year course.

"3. *Stipends.*—All the students who appeared in the annual examinations held stipends, twenty-two being provided by Government and fourteen by district boards or private individuals. In addition, valuable prizes were given to the most successful students by gentlemen interested in the welfare of the College.

"4. *The Infirmary.*—The number of patients again increased, and if the arrangements now contemplated are completed, whereby the infirmary will be registered under the amended Cruelty to Animals Act, and the Entally Glanders Hospital of the Calcutta municipality will be transferred to the College, there will be a large addition to the patients and increased opportunities to the students for the observation of animal diseases. Financially the receipts grew from Rs. 5878 in the previous year to Rs. 6355, whilst in consequence of various economies the expenses decreased from Rs. 5553 to Rs. 4502. The surplus of Rs. 1853, which may be taken as a partial remuneration for the medical services rendered, is satisfactory and typical of the practical character of the administration of the College.

"5. *Veterinary Assistants.*—As all the students of last year have continued their studies, the number of passed assistants has not increased. The demand for their services is great, and is likely to increase in the near future, as the scheme for the organisation of a veterinary department is developed. That scheme contemplates the eventual provision of a dispensary in each district with a veterinary assistant in charge and an itinerant assistant employed in the interior. Already most of the district boards have agreed to these proposals in a modified form, and no doubt ultimately the success of these institutions in neighbouring districts will lead public opinion to insist on their adoption in the remainder. There will thus be for some years a steady demand for qualified assistants, to the best of whom will be open the prospect of employment on the inspecting staff which will ultimately be created. Meantime, of the thirty-five men who have passed out of the Belgatchia Institution, no less than twenty-five hold appointments and six are in private practice. Of the remainder, one only has proved unsuccessful.

"6. *Veterinary Dispensaries.*—A detailed report of these institutions has been submitted by the Superintendent, from which it is gathered that some are successful financially and professionally and others are only partially so. It is inferred, however, that all would have a greater chance of success if they received more constant support from the local authorities and enjoyed the benefit of more frequent inspections by the head of the provincial department. Veterinary-Major Raymond's opportunities for the inspection of outlying institutions were considerably lessened owing to the demands made on his time by the researches he carried on during the year with reference to rinderpest. The Lieutenant-Governor, while fully

recognising the very valuable nature of these researches, and the great ability with which they have been prosecuted by Major Raymond, desires that in future they may not be allowed to retard the very necessary duty of inspecting the work which is being done by veterinary assistants outside Calcutta.

"The most notable example of private generosity in connection with the institution of veterinary institutions is that of Kumar Rameshwar Malia and other gentlemen of Howrah, who have subscribed over Rs. 30,000 for building and endowing a dispensary. The Lieutenant-Governor trusts that it will prove to be so useful as to encourage other gentlemen elsewhere to follow this excellent example.

"7. *Outbreaks of Epidemic Disease.*—Much evidence was accumulated during the year of the wide prevalence of glanders in Calcutta, and it is understood that proposals for combating this dangerous disease will shortly be submitted to Government. The other most notable outbreak of glanders was at Dumka, where steps were promptly taken to suppress the disease. Rinderpest, too, was fatal in an unusual degree in Calcutta. In the mufassal it does not appear to have been abnormally active, yet it is reported that in one district alone it carried off no less than 27,000 cattle. If these were worth only Rs. 10 each, the loss to the district was Rs. 270,000; and the maintenance of an even insignificantly successful veterinary staff in the district would have been a prudent measure of insurance.

"8. *Experiments.*—An outbreak of rinderpest during the year at a large farm under European management afforded a favourable opportunity for testing the value of inoculation with bile as a preventive, and the results appear to fully justify the extension of experiments with this substance, but this excellent method will probably not for some time, owing to Hindu prejudices, be very extensively employed. In addition, other experiments which have been reported to Government were conducted during the year, and appear to promise results of interest.

"9. *Improvement of Stock.*—The progress made in this direction was the least satisfactory feature of the work of the department during the year; but a scheme is under consideration for the opening of a breeding farm at Pusa, in Darbhanga, which, it is hoped, will ultimately result in the steady supply of suitable bulls for the province. In the direction of horse-breeding it has been decided, with reluctance, that little can be done to counteract climatic and other adverse influences.

"10. The Lieutenant-Governor thanks Veterinary-Major Raymond for his conduct of the affairs of the department, in developing which he has been equally energetic and successful.

"By order of the Lieutenant-Governor of Bengal,

"F. A. SLACKE,

"*Secretary to the Govt. of Bengal.*"

ON ANTISEPTIC THERAPEUTICS.[1]

I will now call your attention to—

A POSSIBLE CAUSE OF AZOTURIA.

A. W. BALCH (Laboratory of Pharmacology, Harvard Medical School).

The similarity between certain of the symptoms existing in the disease azoturia and those commonly found in lead poisoning seemed to make the chemical examination of urines and tissues in these cases desirable.

Examination of the urines from both azoturia cases and normal horses showed the presence of lead in several instances, although negative results were also obtained in both the normal and pathological cases. Chemical examinations were then made of brain, liver, spleen, kidney, and psoas muscle whenever possible, in order that the distribution of lead in the system might be studied.

Organs were taken from normal horses and those in which death had followed azoturia, pneumonia, and colic. As in the urines, lead was found in the tissues of cases other than azoturia, but the amounts were much larger and the lead was much more widely distributed in the azoturia cases.

The quantity found in several of these cases, notably the livers, was very large indeed, as shown approximately by the final tests employed, while in cases other than azoturia a large amount was never found.

The qualitative results have been placed in tabular form, but the quantities could not be expressed, as we have no method for accurately determining these small amounts of lead.

ORGANS FROM AZOTURIA CASES.

	Brain.	Liver.	Spleen.	Kidney.	Psoas.	Urine.	Blood.	
12		+	+	+	+	−		
17		+		−		+		
22	+	+	+	+	+	+	?−	Elimination of lead increased by potassium iodide.
23	+	+		−		−		Lead found in urine after potassium iodide.
26	+	+	+	+	−		+	
33		+	+	+	+			
35	+	−	+	−	+	−	+	
37	+	+	+	+	+		+	

ORGANS FROM CASES OTHER THAN AZOTURIA.

	Brain.	Liver.	Spleen.	Kidney.	Psoas.	Urine.	Blood.	
25		+	−	+	+	−		Pneumonia.
27		−	−	−	−			Runaway.
28	+	+ −	−	+		−		Some interstitial change in kidney. Broken leg.
34		+	−	−	+			Colic.
36	−	−	−	−		?+		Colic.
38	−	+	−	+	−			Colic.

[1] Abstract from a paper read before the American Veterinary Medical Association, September 6, 1900, by J. F. Winchester, D.V.S., Lawrence, Mass.

Urines.		Azoturia.	Urines.		Normal Horses.
1.	+		8.	−	
2.	+		9.	+	
3.	+		10.	−	
4.	+		11.	−	
5.	−		13.	+	
6.	+		14.	+	
7.	+		25.	−	
12.	−		28.	−	
15.	−		32.	−	
16.	+				
17.	+				
21.	+				
22.	+	Increased by potassium iodide.			
23.	−	Found after potassium iodide administration.			
24.	−				
29.	−				
30.	−				
31.	−				

The results of chemical examination of the spleen are particularly noticeable.

In every case of azoturia lead was found in the spleen, while it was found in none of the other cases examined.

Potassium iodide was administered in two cases of azoturia, numbered in our tables 22 and 23.

In case 23 no lead was found before the administration of potassium iodide, but after its use very large tests were obtained.

In case 22 the amount eliminated was greatly increased.

Lack of material prevented similar experiments in normal horses. For examination of urine about one litre was used in each case. For tissue examination one-half the brain, weighing when fresh about 300 G., or dried, 50 G., and of other tissues, 300 G. fresh or 100 G. dry, were used. The tissue or dry urine was treated with an excess of nitric acid and allowed to stand until the violent reaction was over.

To the resulting fluid, after concentration to a small bulk, 28 cc. concentrated sulphuric acid was added, and the heat continued until charring resulted. The fat was not removed. The process was then continued by alternately adding nitric acid and charring by heat until the organic matter was practically destroyed. During the heating a part of the sulphuric acid was always decomposed, so that the product (free from nitric acid) varied in bulk from 10 cc. to 25 cc., depending in part upon the amount of solids present.

This product was diluted with an equal volume of water and the mixture again diluted with an amount of alcohol equal in volume to the sulphuric acid and water used. From this mixture, after standing several days, the lead was deposited as sulphate. The deposit was washed on a paper filter with 50 per cent. alcohol made acid with sulphuric acid, and was then extracted with 10 per cent. ammonium acetate solution. From this solution the lead was precipitated as sulphide, and in case much iron was present it was removed with very dilute hydrochloric acid. The lead was then converted into chloride by concentrated hydrochloric acid and removed from the filter by hot water. After evaporation the lead chloride was dissolved in a few drops of hot water, the solution filtered if necessary, and four final tests made, *i.e.*, potassium dichromate, potassium

iodide, sulphuric acid, and hydrogen sulphide. Lead was considered as present only when all four tests were obtained.

The paper is presented merely as a preliminary statement of the facts obtained thus far, and in no sense as conclusive evidence of the origin of azoturia. The wide distribution of lead makes proof by chemical means alone impossible, but the results obtained are certainly suggestive.

An attempt is to be made to produce the disease in normal horses by the administration of lead salts.

THE PATHOLOGY OF AZOTURIA.

(*Preliminary Communication.*)

W. R. BRINCKERHOFF, S.B. (From the Sears Laboratory of Pathology.)

The material upon which the following description is based was derived from eleven autopsies upon undoubted cases of azoturia, occurring in Boston between January 1 and May 1, 1900. The work was undertaken as supplementary to the chemical investigations of Dr. Balch, and is not intended to be a complete description of the pathology of the disease. The liver, spleen, kidney, and psoas muscle only were studied. For control, the organs from three normal horses, three cases of colic, and one of pneumonia were examined.

Gross Anatomy.—The organs were examined as soon after the death of the animal as possible, usually within six hours. The following points were observed:—

Liver.—In the acute cases the liver, on section, showed nothing abnormal. When the disease had been of a longer duration the cut surface presented small pale yellow areas corresponding in distribution to the centres of the lobules.

Spleen.—In the spleens of two cases there could be felt firm lumps from 1 to 5 cm. in diameter, which on section of the organ were seen to be of a deeper red colour than the rest of the spleen substance. These hæmorrhagic infarcts have been frequently observed in the spleen in azoturia. In the other cases examined nothing of note was seen in the fresh spleen.

Kidney.—The examination of the fresh kidney showed nothing but a marked congestion of the organ.

Psoas Muscle.—In all accounts of azoturia the psoas muscle is spoken of as exhibiting a marked degree of fatty degeneration. In every case examined this muscle on section was notably pale, and bits of it teased out in glacial acetic acid showed many fine and coarse fat drops, both free and within the muscle fibres. The same appearance was noted in a case of pneumonia.

Microscopic Anatomy—Technique.—All tissues were fixed in Zenker's fluid for twenty-four hours, washed in running water overnight, and hardened in 80 per cent. alcohol. The material was then cut into small pieces and passed through two changes of 95 per cent. alcohol, two changes of absolute alcohol, one of chloroform, and one of chloroform saturated with paraffin, remaining in each twenty-four hours. The tissue was then embedded in hard paraffin and cut. Sections from each organ were stained with Unna's methylene blue and eosine, Mallory's connective tissue stain, and alum hæmotoxylin.

Liver.—All the livers examined had certain characteristics in common.

The capillaries in all were markedly injected. The liver cells contained fine brown granules, and the perivascular spaces were dilated, containing granular material taking the acid stain, presumably precipitated albumen of the serum. This pigment in the liver cells occurs in the livers of normal horses, but not to the extent seen in azoturia. Aside from these slight variations from the normal, two distinct types of lesion were found. In five cases the picture was one of a diffuse process, while in four the lesion was distinctly local in character.

In the first type the centres of the lobules seemed most affected. In the area around the central vein the liver cells were relatively small, distorted, and presented a greater or less degree of vacuolation.

In the second type, small areas, bearing no constant relation to the anatomical structures of the organ, were to be seen, in which the liver cells had more or less completely disappeared, the space left being filled with dilated capillaries. Around such areas the nuclei of the liver cells frequently did not stain, the protoplasm being vacuolated and often invaded with leucocytes.

The focal and diffuse lesions were not found associated in any of the cases examined.

Spleen.—The spleen presented no constant lesion. In seven of the nine examined histologically there was a large amount of brown pigment, in the form of spherules from one-half to one u. in diameter, enclosed within cells in the pulp. Two spleens showed in the centre of the lymph follicles a circumscribed area, composed of epithelioid cells, many of which contained in their protoplasm nuclear fragments. The appearance simulated closely that seen in diphtheria.

Kidney.—The kidneys exhibited the most constant lesions of any of the organs examined. In every ease there was acute parenchymatous degeneration, shown by a more or less extensive degeneration of the convoluted and the collecting tubules. Casts were occasionally found. In six of the ten cases in which the kidney was examined microscopically, there was evidence of a chronic interstitial process, consisting in small areas in round cell infiltration, containing atrophied tubnles (one case), or in the formation of interstitial tissue around the glomeruli, with occasional bands of connective tissue surrounding atrophied tubules and glomeruli. There was, in several cases, a diffuse increase in the interstitial tissue of the pyramids. In one kidney almost every glomerule was surrounded by more or less connective tissue.

Psoas Muscle.—As a matter of routine, the psoas muscle was examined histologically in every case. In seven out of ten there was a more or less extensive degeneration of the muscle fibres. The change was selective, attacking some fibres, and leaving wide areas of normal structure intact. The affected fibres were unevenly swollen, and contained hyaline areas which were irregularly eroded, and often invaded by leucocytes. In a single muscle fibre degenerated portions were seen alternating with apparently normal muscle structure. A dissolution of parts of some fibres had taken place, and the sarcolemma could be traced from one hyaline mass to another, the intervening space containing only a small amount of granular detritus. In some cases there was evidence of repair shown by the presence of young connective tissue cells around the necrotic fibres. In the psoas of the one case of pneumonia examined the same appearance of degeneration was seen, and was there rather more intense than that observed in any of the azoturia series.

Summary.—In the eleven cases of azoturia examined changes were found in the liver, spleen, kidney, and psoas muscle. The lesions were—

Fatty degeneration of the liver—(Five cases).
Focal necrosis in the liver—(Four cases).
Proliferation of the epithelioid cells in the lymph follicles of the spleen—(Three cases).
Hæmorrhagic infarcts in the spleen—(Two cases).
Pigmentation of the spleen—(Seven cases).
Parenchymatous degeneration of the psoas muscle—(Nine cases).
Acute parenchymatous degeneration of the kidney—(Ten cases).
Chronic interstitial nephritis—(Eight cases).

Conclusions.—(1.) The acute degenerations of the liver and kidney, the proliferation of epithelioid cells in lymph follicles of the spleen, and the focal necroses in the liver, are similar to lesions found in man during various of the acute infectious diseases. In the case of the human being such changes are generally regarded as manifestations of a toxæmia.

(2.) The pigmentation of the spleen indicates nothing more than a destruction of blood corpuscles, and is common to a number of diseases in both man and animals.

(3.) The degeneration of the psoas muscle is quite analogous to the Zenker's degeneration seen in typhoid fever.

(4.) The chronic interstitial nephritis would indicate either that some toxic substance had acted for a considerable time, or that there had been previous attacks of an acute nature.

We have, then, the picture of a pathological process combining chronic and acute factors. This condition seems most reasonably explained by postulating the presence in the organism of a toxic substance, perferably one capable of causing both acute and chronic changes.

In this stndy of the lesions found in azoturia, pathological changes have been found which merit further study, and it is my intention at some later date to carry out this investigation in more detail. Experiments upon animals have been begun, but the material at hand from that source is not sufficient to be reported at present, and is also reserved for later publication.

The table formulated by Dr. Balch gives the result of the chemical examinations made by him, the heavier lines showing those cases in which the larger amount of lead was found.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

THE first meeting of the Council of this Society for the present year was held on February 6th, at 13 Hanover Square, W., Earl Cawdor (President) in the chair.

The Hon. CECIL PARKER (Chairman) presented from the Veterinary Committee a report by Professor M'Fadyean, from which it appeared that since the date of the last Council meeting outbreaks of foot-and-mouth disease had been detected in Essex and in Suffolk, near Ipswich. During the last few days four other outbreaks had been discovered within a short distance of the last of these, and also a fresh centre in Kent.

Mr. A. C. COPE said that the great difficulty had been to detect the

actual place of origin of the outbreaks of foot-and-mouth disease. What they did know, however, was the manner in which it had been spread. Where, for instance, cases of the disease had been discovered upon a farm it was ascertained that it had actually been in progress for some time before its character was recognised. That was one of the reasons for the continued prevalence of the disease, more particularly among sheep. The Board of Agriculture had been most successful in preventing the disease from spreading. He urged the cordial co-operation of agriculturists and stockowners in giving the Board early notice of any suspicious cases.

Mr. BOWEN-JONES suggested that the circular of the Board of Agriculture describing the symptoms of the disease should be again issued, if possible with fewer technical terms in it.

Mr. TERRY knew of instances where veterinary surgeons had been attending sheep afflicted with a disease which they did not recognise, but which was afterwards proved to be foot-and-mouth disease.

Professor M'FADYEAN said that he was only aware of one case in which foot-and-mouth disease had not been at once diagnosed. The progress of the disease might certainly be partly due to the inability of the rising generation of veterinary surgeons and stockowners to recognise the symptoms at once; but it must be remembered that their duty was restricted to observing if the feet or mouths of the animals became affected in any way, and to report to those upon whom the duty devolved of making an inquiry. The fullest publicity should be given to the fact that stockowners should make immediate report of any symptoms affecting the mouths or feet of any of their animals.

Various reports relating to the details of the meeting of the Society to be held at Cardiff next June were presented. The regulations of the proposed horse-jumping competitions and of butter-making competitions were submitted and approved, and ordered to be issued.

As to the meeting of 1902, the committee of selection drew attention to their recommendation, adopted on May 2, 1900, that the country meeting of 1902 should be held in some town in District G. (Lancashire, Cheshire, and North Wales), provided that some suitable and adequate site were offered for the purpose. The committee had to report that no invitation had yet reached the Society from any town in District G; it appeared to them, therefore, that the time had now arrived when the Society's invitation should be thrown open to any other part of England that might be willing to receive the Society in 1902. A formal resolution to this effect was carried.

LORD MORETON (Chairman) reported from the Education Committee that the arrangements had been completed for the examination of the National Diploma in Agriculture to take place at the Yorkshire College, Leeds, in May next.

A letter was read from the British Congress on Tuberculosis inviting the Society to send delegates to the Congress to be held in June next, and it was resolved that the Chairman of the Veterinary Committee (Mr. Parker), Sir George Brown, C.B., consulting veterinary surgeon, Dr. Voelcker, consulting chemist, Mr. Harold Swithinbank, and Sir Ernest Clarke (secretary) should be appointed delegates to attend the Congress.

Other matters having been laid upon the table, the Council adjourned until Wednesday, March 6.

THE VETERINARY MEDICAL ASSOCIATION OF IRELAND.

THE Annual Meeting of the Veterinary Medical Association of Ireland, which had been postponed owing to the death of Queen Victoria, was held in Dublin on Thursday, February 7th. Mr. M. Hedley, President, occupied the Chair.

The President referred to the loss which the country had sustained by the death of Queen Victoria, and a resolution of condolence was unanimously adopted and ordered to be transmitted through the Home Office.

The following officers were elected :—President, Mr. Hedley (re-elected); Vice-Presidents, Mr. Charles Allen, Principal Mettam, Mr. John Freeman, and Colonel Charles Steel ; Treasurer. Mr. Charles Allen ; Secretary, Mr. James M'Kenny ; Council, Messrs. P. J. Howard, A. J. Beckett, R. B. Freeman, E. Wallis Hoare. F. C. Mason, F. Kerr, J. D. Richardson, J. V. Daly, and W. J. Moran.

It was decided that two medals should be presented to the Royal Veterinary College of Ireland for competition by its students, the design and superscription to be considered at a future meeting.

Principal Mettam read an exceedingly instructive and highly technical paper on "The Histology of the Blood," being the first of a series of papers which he intends to submit to the Society. A large number of specimens which had been specially prepared in connection with the paper, were exhibited under the microscope.

VETERINARY INSPECTIONS AT CATTLE SALES.

IN the Edinburgh City Police Court on 13th February—Sheriff Orphoot on the Bench—James Martin, cattle dealer, 47 Lauriston Place, Edinburgh, pleaded not guilty to a charge of having contravened section 43 of the Public Health Act, 1897, in so far as upon the 11th December he was the person to whom belonged a live cow which was deposited in the saleyard in Valleyfield Street, Edinburgh, occupied by Messrs. Oliver and Sons, for the purpose of sale, and intended for the food of man, and which cow was unsound and unfit for food. Evidence was led. Mr. David Murray, solicitor, who defended, intimated that the diseased condition of the animal was admitted. John Riddoch, veterinary inspector, stated that he seized the cow at the Messrs. Oliver's sale on the date mentioned. It was breathing with considerable difficulty and coughing, while its udder was hard and swollen, and the cow was evidently suffering from tuberculosis. After it was slaughtered the organs were found to be affected with tuberculosis to a very large extent. Dr. Williamson, chief sanitary inspector, corroborated. For the defence, the accused said he purchased the cow the previous day at Messrs. Oliver's public sale at Hawick, where all the animals were previous to sale inspected by a veterinary inspector. He observed nothing wrong with the cow, and forwarded it to Edinburgh, to be taken to the Messrs. Oliver's sale there. William Hamilton, farmer, Hawick, said he sent the animal to the sale at Hawick. In the spring of last year it gave birth to a calf prematurely, and was somewhat unwell. It was put out to the grass, however, and improved, and was

evidently quite well when he sent it to the sale. Andrew Oliver, of the firm of Messrs. Oliver and Son, spoke to selling the cow and seeing nothing about it which would have led him to think that it was suffering from tuberculosis. Robert Scott, veterinary surgeon, Hawick, deponed that he examined all the animals before they were put into the ring on that occasion, and did not notice anything wrong with the cow. James Moffat, cattle dealer, and William Robertson, an employee of the accused, were also examined for the defence, and this concluded the proof.

Sheriff Orphoot, in giving his decision, said the question to be decided was whether the accused had proved, first, that he did not know; and, secondly, that he could not, with reasonable care, have known that the animal was in the condition charged. As to the first point, he thought that the accused had established that he did not know that the cow was in the condition stated; in fact, he did not think that the prosecutor seriously contended that the accused did know. Accordingly, the real question in the case was whether the accused could not, with reasonable care, have known the condition of the animal. When purchasing the cow at Hawick, he made a sort of general examination of the animal when it was in the ring—he took a look of it as an intended buyer would do—but that was all. In buying the cow, he relied upon the fact, known in the trade, that the animals exhibited in Messrs. Oliver's yard for sale were, previous to the sale, examined by a veterinary surgeon, and, knowing that, he took it for granted that nothing but sound animals would be sold there. The question in the case was whether his reliance upon that understanding of the trade constituted the reasonable care required by the Act of Parliament. On that occasion the inspector had examined 30 cows and about 200 sheep, and accordingly the examination of such a number of animals must have been more or less of a general sort, and he was not asked to make a special examination of this cow. The question then came to be whether a purchaser was entitled to rely upon such an examination by a veterinary surgeon of the stock in Messrs. Oliver's saleyard. The Sheriff could not decide that. If he decided that, it would open the door for the introduction of animals which would pass the veterinary surgeon examining in Messrs. Oliver's saleyard, but yet animals which might be, as that cow was, in a condition dangerous to the public health. He could not decide in law accepting that examination by the veterinary surgeon in Messrs. Oliver's saleyard as taking the reasonable care required by the Act of Parliament. He therefore thought that the second part of the defence was not established. While he arrived at that result, he had no doubt the accused acted in accordance with the usual practice of the trade. His Lordship did not think the case one for a severe penalty, and inflicted a modified penalty of £2, with expenses.

Clinical Papers.

A FALSE STOMACH.

BY JOHN CONNOCHIE, M.R.C.V.S., AYTON.

THE subject of this case was a yearling bullock that had been grazed on the farm all summer. After being brought in at night and had turnips and straw, for some time he was noticed to be off his feed and slightly swollen.

An ordinary purgative dose was administered by the owner, and I was only sent for a few days later on the appearance of a swelling on the lower border of the neck. I found this swelling to extend from an inch or two behind the angle of the lower jaw to almost the sternum. It entirely surrounded the lower border of the neck and stretched up each side to a depth of seven or eight inches, bulging out rather more on the near side than the off. It was hard and only slightly painful to the touch. I hazarded an opinion that it might be the result of an injury, but was not very decided about it as the swelling commenced and terminated so abruptly and was so uniform in appearance.

As rumination was completely suspended and he was very tympanitic, I inserted a canula into his rumen and kept it there. He was put on a sort of milk and gruel diet as swallowing anything solid or dry seemed to hurt him, and was rarely attempted. The swelling was fomented, smeared with belladonna plaster, and wrapped up in flannel. About a week afterwards the extreme hardness disappeared, and although there was no appearance of pointing anywhere, still, from the sort of tense feeling it had, I was convinced there was fluid inside. Choosing, therefore, a spot clear from the jugular vein and carotid artery, at the most prominent part of the swelling, which was on the lower third of the near side of the neck, I inserted a small trocar and canula and out poured fluid and plenty of it. At a first glance I thought it was pus, but soon found that it was whey, just what you would expect to find in an animal's stomach while on a milk diet.

The idea of dilatation of the œsophagus then occurred to me. I had thought of it before but put it aside on account of the swelling embracing the right side of the neck so much. To satisfy myself I then, while the canula was still *in situ*, administered some new milk, which the animal swallowed somewhat easier than usual, but it did *not* escape by the canula, only whey. This was rather bewildering. I next tried pure water and it did not find its way through the canula either while he was swallowing, but I thought some of it did rather later. The canula was kept in for two days and the swelling got considerably less, but it was noticed always to get rather bigger after he was fed. The quantity of whey that escaped was enormous. By way of proving the normal condition of the œsophagus I passed the probang, but found it did not glide down easily, and seemed to catch about the entrance to the stomach. At this stage treatment was stopped, with the exception of keeping the canula clear in the rumen and allowing milk and gruel, as the case seemed hopeless. On the elapse of another week he seemed sinking, so was finished off.

At the post-mortem I made an incision right into the swelling and gallons of whey escaped, evidently coming up from the stomach. After it had ceased it was apparent that the swelling consisted of an elongated sac with thin walls, situated alongside the œsophagus, and terminating, as I said before, in a blind extremity a few inches behind the angle of the jaw. Inferiorly it was continued into the thorax, for on severing the neck from the trunk, instead of there being only two openings, the œsophageal and the tracheal, there was a third as large again as the latter. On following up this new canal it was found to keep close to the left side of the œsophagus, over the base of the heart, where it seemed to come into contact with the chest wall, as there was an adhesion, and it disappeared along with the œsophagus into the rumen within the foramen sinistrum, which was much

dilated. There were not two distinct openings into the rumen, as the canal seemed to blend with the œsophagus at the cardiac orifice, which was also dilated and protruded through the foramen. The wall of the canal was by no means thick, and in the neck the sac seemed to be produced by food being forced up between the muscles, the intermuscular fascia ultimately becoming thickened, thus forming a boundary.

The hard nature of the swelling at first was doubtless due to the sac being full of solid ingesta, and latterly, when soft, to it containing the fluid of the milk diet.

No one seems to have observed anything unusual about the animal until he became unwell.

A discussion and opinion as regards the congenital or traumatic nature of this case will be welcomed.

LYMPHANGITIS IN AN EIGHT MONTHS OLD FILLY.

BY W. OWEN WILLIAMS, F.R.C.V.S., EDINBURGH.

On Saturday, the 2nd February, I was called to the country to see a pedigreed Clydesdale filly, which had been discovered to be very lame when seen first thing in the morning.

No reason could be assigned for the lameness. The filly had been out in a field the previous day, and was more lively and frisky than even usual, and had been seen racing up and down several times during the afternoon. When brought in at night she seemed to be in the best of health.

On examination, I found her to be excessively lame in the near hind leg, and to have great swelling and pain of the inguinal glands, and the large lymphatic in that region. The body temperature was 103-5, the pulse 68 and full, respiration slightly hurried, and the mucous membranes injected. I further discovered that she was getting a considerable quantity of oats per day, and that she had been kept indoors owing to bad weather for several days prior to Friday.

The instructions given were to administer in a drench some Epsom salts, treacle, and water, to foment the leg, and then bandage with flannel, stop all corn, and give sloppy mash. Next morning I found the limb swollen all the way down, the pain much less, but the temperature and pulse the same. The bowels had not moved, and on inquiry found that the caretaker had disobeyed my orders, and given half corn and mash.

On the Monday the bowels were freely moved, the pain and the lameness had disappeared, and the temperature and pulse had both fallen, and she recovered in a few days.

I simply record this case as I do not remember having seen or read of a case of lymphangitis in so young an animal.

Extracts.

ON THE MILIARY FORM OF ACTINOMYCOSIS OF THE GANGLIA IN THE OX.

Veterinary Surgeons Kowalewsky and Siviatoslawsky, in a report on lesions of the glands in oxen slaughtered at the Stavropol abattoir, state that in eighty cases which they have examined microscopically they have found forty animals affected with miliary actinomycosis of the retro-pharyngeal glands. These lesions may be formulated as follows :—

1. Increase of volume of the gland affected. The size may exceed the normal three or four times. In cases in which the actinomycosic granulations in the glandular parenchyma are few in number the volume may be normal.

2. Hypertrophy and induration of the diseased gland, the external surface of which is knotty and hard, and incision requires a certain effort. In cases in which the parenchyma of the gland is the seat of small (embryonic) granulations, restricted in number, the hypertropdy may be wanting or very feeble.

3. On section the diseased gland is sometimes succulent; we may perceive in it restrained or diffuse hyperæmia and extravasated blood; the boundary of the cortical and medullary layers of the gland in many cases is not visible. Owing to the hypertrophy of the interstitial conjunctive tissue of the injured gland we may observe, specially in the medullary layer, either slender, white, gleaming bands, or fairly broad zones, which occupy nearly all the surface of the medullary layer.

4. The presence in the parenchyma of the diseased gland, very seldom on the external surface of the latter, of three kinds of actinomycotic granulations :—(*a*) Very small granulations or hard white knots, of the size of a millet or hemp seed, which are either isolated or in some cases gathered together on the cortical layer of the gland in masses. These granulations are commonly gleaming, hard, of white or yellowish-white colour, and surrounded by a slender white zone of conjunctive tissue. After the extirpation of such a granulation, we find on making microscopic preparations that it is very hard, and surrounded, like the cysticercus, with a somewhat resisting fibrous shell, which in its turn is enveloped in a gelatinous layer. The number of these granulations varies from 1 or 2 to 12 or 14 or more. This is the form of glandular actinomycosis very frequently observed in the Stavropol abattoir, and appropriately termed miliary form by reason of the small volume of the very fine granulations which characterise it, and in analogy with miliary tuberculosis. Microscopic preparations of the knots above mentioned, which have been previously macerated for fifteen to twenty minutes in a 3 per cent. solution of potassium and coloured with picrocarmine, have always shown radiated groups of actinomycosis. (*b*) Foci or agglomerations of small, gleaming, white or yellowish-white granulations, which present themselves under the form of round or oval tumours, $\frac{1}{2}$ to 1 centimetre long, composed of a variable quantity (6 to 10 and more). Granulations of the volume of a millet seed, surrounded with a white fibrous layer, in which we find thick creamy-white pus that issues from the granulations when pressure is made on the base of the focus with a squeezer. In addition to these masses of small purulent granulations, we

find hard foci without trace of granulations, of round or oval form, which on incision are found to be succulent; microscopic examination of the succus shows radiated groups of actinomyces. The spongy mass of an actinomycoma has been found to be composed of very small abscesses separated from one another by webs of conjunctive tissue. In the pus of these abscesses are found radiated groups of actinomyces surrounded with leucocytes. The whole mass of the actinomycotic tumour (actinomycoma) is composed of fibrous conjunctive tissue. The groups of actinomyces in the abscesses may be calcified, and in such cases they present themselves under the form of yellowish seeds visible to the naked eye. (*c*) The presence of granulations or small tumours of the volume of a hemp-seed or of a pea, not hard, round, of a yellow or reddish-yellow colour, few in number (1 to 4), and having a great resemblance to miliary tuberculosis at first sight. In some cases these granulations are very small —they do not exceed the volume of a millet seed, they have a homogeneous consistency, and do not gleam so much as the (*a*) granulations. These granulations always contain radiated groups of calcified actinomyces, there is no pus even when strong pressure is applied, and they are somewhat soft.

In the majority of the cases of miliary actinomycosis which they have observed, Messrs. K. and S. had to deal, not with a secondary lesion, as is commonly thought, but with a primary, for the most minute examination of the second retro-pharyngeal gland of the tonsils, of the superior tracheal gland, and of the sub-maxillary showed no lesion. The logical conclusion is, that in such cases of primary granular actinomycosis the gate of entry for the parasite was the buccal mucosa, or perhaps, owing to small excoriations or other wounds, the germs with the lymph arrive at the nearest gland, where they stop, produce acute chronic lymphadenitis, and commence to breed. The miliary form, which may at first sight be easily confounded with miliary tuberculosis, presents a primary stage of the processes of actinomycosis, and we may regard the solid granulations without pus as an embryonic phase, for probably suppuration soon supervenes.

(*Journal de Méd. Vét. de Lyon.*)

THE TRANSMISSIBILITY OF ANIMAL TUBERCULOSIS TO THE HUMAN SUBJECT.

A Commission was some time ago appointed by the French Government to inquire into the above, and has now formulated its recommendations as follows:—

1. Meat intended for public consumption ought not to be sold or hawked unless bearing a mark which shows that it has been examined by an inspector appointed for the purpose. Inspection ought to be carried out everywhere, in town or country; it can be easily and cheaply organised, as has been proved in Belgium.

2. All dairy establishments, where milk is produced for public consumption, ought to undergo periodical examination. All cows attacked with mammitis in the intervals of inspection ought to be at once pointed out to the veterinary inspector, and, pending the confirmation of the

diagnosis, ought to be kept apart from the other cows, and their milk boiled before being sold or consumed on the premises, even by animals. If the mammitis is of a tuberculous nature notice must be sent to the magistrates, who will order the immediate slaughter of the animal, in conformity with the (French) rural code.

3. The bye-products of butter and cheese factories (skimmed milk, whey, butter milk, &c.) ought not to be sent out for consumption by men or animals until they have been "pasteurised" at a minimum temperature of 85° (Centigrade).

4. Tuberculosis of the pig and of the goat ought to be added to the list of contagious diseases subject to police supervision, and all regulations applicable to milch cows ought to apply to goats. Inspection of meat ought to be more rigorous in the case of tuberculous swine than in the case of cows and goats.

5. It is the duty of sanitary authorities to acquaint all whom it may concern with the danger which they incur in sleeping in places which contain tuberculous cows. Nocturnal supervision of the cow-house may be secured by means of a glazed window looking out on the cow-house but not communicating directly with it.

6. Until these regulations are put in force every means must be used for the purpose of making it clear to the population generally that the simplest and surest means of protecting themselves against danger from milk is to boil it before using.

Commenting on the above, M. Nocard says:—"We all know how tenacious and wide-spread is the erroneous belief that boiled milk has lost its digestibility, and even a part of its nourishing qualities. It will be difficult to overcome this prejudice, but much might be accomplished by judicious efforts if, for example, it were forbidden by law to certificated nurses to give unboiled milk to the babies entrusted to their care. Perhaps also something might be done with school children. Might we not hang up in every class a notice to this effect:—'Don't spit on the floor; don't drink unboiled milk?' The grown-up man does not forget the impressions made on him in his childhood.

(*Recueil de Méd. Vét.*)

GENERALISED SARCOMATOSIS IN A COW.

THE presence of sarcomata has been observed as a lesion in a great number of organs, such as the rumen, stomach, uterus, &c., but in many cases these tumours have remained isolated. Frequently, however, they become generalised, and then they assume all the characteristics of infectious tumours as in the dog, when ganglionary sarcomatosis assumes the characteristics of the disease in man described as pseudo-leucæmia or Hodgkin's disease. One point in the genesis of sarcoma still remains obscure, as in that of most neoplasms of infectious character, and without offering an opinion as to the parasitic or microbic nature of this tumour, I may state my belief that the point of outbreak is no unimportant factor in its evolution. We are still unable to explain to what extent the tissues have to be modified in order to undergo sarcomatous infection; we observe its evolution often in parts protected against external injuries, such as the

pleura, peritoneum, brain, but in some cases it is impossible to deny the part played by external injury. The following case shows that a contusion on the angle of the ischium was the starting-point of an enormous sarcomatous tumour, which soon invaded the majority of the visceral organs.

A cow, seven years old, began to show, as the result of a contusion, hæmatoma at a point corresponding to the external angle of the ischium. The extravasated blood not being reabsorbed within a certain time, the tumour was opened and treated in the usual way with injections of creolin, but, strangely, the tumour did not disappear; it was even noticed that the base began soon to proliferate and to gain upon the neighbouring parts, and this went on until at the end of three months the neoplasm was twice the size of a man's head, and it was thought desirable to send the animal to our hospital. On her arrival I observed an enormous round swelling as above described, very broad at its base, and stretching on to the neighbouring parts without any clear line of demarcation. The diameter at the base was at least 35 centimetres (about 14 inches). On the external surface I noticed four very deep irregular grooves, at the base of which a quantity of very fœtid pus was found. The skin all round the tumour presented no peculiarity, and exploration of the neighbouring lymphatic ganglia, and especially of the supramammary, revealed nothing abnormal. Pressure on the neoplasm produced no pain, and enabled me to ascertain that its consistence was depressible and elastic. Judged by its physical characteristics the neoplasm was allied to sarcomata, and this was confirmed by microscopic examination of a fragment; it belonged to the encephaloid sarcomata.

As the general condition of the animal was quite satisfactory, and as careful examination showed no organic injury in the viscera, I determined to remove the tumour. With this object a circular incision was made eight centimetres above the base of the tumour, and the skin was then drawn down all over it so as to expose the base as far as possible. I soon discovered that the neoplasm was not subcutaneous throughout its whole extent; it insinuated itself under the ischio-tibial muscles, invading the cellular tissue which separates these muscles. I was therefore obliged to incise several muscular planes, and by pushing forward the dissection, now with bent fingers, and again with the help of a bistoury, I managed to remove the tumour entirely without any serious hemorrhage. It weighed 16 lbs. The wound caused by the operation had a diameter of 35 centimetres or so at the base, but as I had taken the precaution to make the cutaneous incision 4 centimetres above the base the solution of continuity was much less. A broad pledget soaked with phenicated water was kept applied for twenty-four hours by means of a few stitches. The wound looked quite healthy, and, great care being used, cicatrisation went on very rapidly, so that at the end of a month the wound was no bigger than the palm of one's hand; but unfortunately at this point I noticed an abnormal gemmation near the centre of the wound; astringent and even slightly caustic powders were applied, lotions of lactic acid were used, but I never succeeded in gaining the mastery over this proliferation. Twice over the principal gemmæ were cut out, but all to no purpose; they formed again with alarming rapidity. After a while the appetite became capricious, and the animal grew rapidly thinner; the mucosæ became pale, and death found the animal in a state of complete emaciation. Post-mortem examination showed the presence of numerous sarcomatous neophasiæ of encephaloid character, but of comparatively reduced dimensions (from the volume

of a walnut to that of a hen's egg); no parenchyma was free from them—lungs, liver, spleen, kidneys. The region operated on was the object of a careful dissection, which enabled me to recognise the existence of a fracture of the external angle of the ischium; a pretty big splinter was almost totally detached from it. I think we may admit that the numereus visceral troubles were developed in consequence of the ischial tumour, and this latter was due to the injury which it had received. Could such an effect have been produced if the cow had not been suffering from a special diathesic condition? I think not. A mere contusion cannot cause the evolution of a malignant tumour except in as far as the animal is itself predisposed by the fact of sarcomatous diathesis. We cannot otherwise explain logically the formation of such a tumour as a consequence of an injury, unless we can demonstrate its parasitic or microbic nature, and in the present state of our pathological knowledge this is not possible.

(*Professor Hendrickx in the Annales de Méd. Vét.*).

SLAUGHTER-HOUSE AND MARKET INSPECTION IN BERLIN FOR THE YEAR 1899.

THE following details, taken from the *Berliner Thierärztliche Wochenschrift*, will interest our readers:—The number of people employed in the inspection of meat in Berlin is 557. Of these only 47 are veterinary surgeons. There are no less than 240 trichina inspectors, who have a separate building to themselves, and of these 88 are women. There are 81 assistant inspectors, of whom 44 are women. The remainder are subordinates, with some 8 or 9 officials.

The expenses amounted to £37,843 for the slaughter-house and £12,364 for the examining stations. To cover this outlay the following dues were charged:—At the slaughter-house, for the examination of each head of cattle 50 pfennigs (100 pfennigs = one shilling), each calf 20, sheep 10, swine 85; in the examining stations, for each quarter of beef 40 pfennigs, each calf 25, sheep 20, swine 100, side of bacon 15.

The numbers of animals examined before slaughter were 165,563 oxen, 151,052 calves, 423,321 sheep, and 741,922 swine. Of the animals slaughtered there were found unfit for human food 3230 oxen (1·95 per cent.), 641 calves (·42 per cent.), 263 sheep (·06 per cent.), 4532 swine (·61 per cent.). In addition to the above, objection was made to 202 oxen. Of organs and viscera altogether 259,256 pieces were destroyed, also 858 unborn calves.

The animals which died before slaughter were 6 oxen, 44 calves, 5 sheep, and 276 swine. In the case of 2 oxen the cause of death was inflammation of the spleen, and of 261 swine erysipelas. In the other animals the troubles were connected with the alimentary canal.

The diseases detected in the public slaughter-houses were:—Foot-and-mouth disease in 308 oxen and 1 calf; erysipelas of one form or other in 643 swine, and swine-plague in 39 swine. Tuberculosis affected 38,320 oxen (23·14 per cent., as against 19·66 per cent. in the previous year), 440 calves (·29 per cent., same as previous year), 43 sheep, and 29,751 swine (4·01 per cent., as against 3·92 per cent. in previous year). The increase of tuberculosis in oxen was all the more striking as there had been a slight

decrease in the preceding year. The number of cases of tuberculosis in swine has doubled within five years, a circumstance which, especially in view of the short life of swine, demands serious attention, all the more so as the increase appears to have gone hand in hand with the extension of co-operative farming.

At the examining stations (for goods brought from the country and abroad) there were examined 257,154 quarters of beef, 137,895 calves, 31,336 sheep, 145,717 swine, 58,052 foreign hams, and 24,908 sides of bacon. In fresh meat there was an increase as compared with the previous year, in preserved foreign meat a decrease. Foreign fresh meat came only from Denmark, in the form of 35,044 quarters of beef, 869 calves, and 18 sheep. Hams came principally from America and Austria, bacon from America. Of the imported fresh meat 978 quarters of beef, 278 calves, 12 sheep, 30 kids, and 104 swine were stopped at the station. Of 1614 wild swine examined 15 were stopped, one of these for trichinosis and two for swine plague.

The value of the meat sold as above is reckoned to be £7,800,000, and the weight a little over 154,000 English tons. The population of Berlin is 1,826,750.

ACTINOMYCOSIS IN ARGENTINA.

THE diffusion of actinomycosis has this year assumed proportions hitherto unknown, especially in the north-east of the province of Buenos Ayres—indeed it threatens to interfere very seriously with the breeding industry of the province. The number of animals affected is reported to exceed 10 per cent. The disease was reported to me in July last, and no cause has been assigned for the sudden outbreak. On visiting a farm, after confirmation of my clinical diagnosis, I subject all the well-bred animals to my treatment, which is, I think, peculiar to myself, and which has had the most satisfactory results. As for the ordinary animals, I advise that, when attacked, they be separated from the healthy animals, and afterwards sent to the slaughter-house or consumed on the premises. I have had innumerable consultations and visited innumerable establishments. The farms were mostly a picture of desolation, especially those on which delay had taken place in the segregration of diseased animals. The disease has shown itself under all the well-known clinical aspects, and many others not common or not yet described. I may mention, amongst others, two cases localised in the lower jaw, two in the trajectus of the sheath and round the preputium. In one of these the abscesses were distributed over all the trajectus as far as the scrotum. There was a case of double arthritis, tarso-metatarsal and metatarso-phalangeal; from the first articulation to the phalanges it was a shapeless mass of considerable volume. Following the chain of the lymphatics, I found abscesses of varying dimensions as far as the popliteal ganglia. The hard "wooden" tongue and the bony form have also been met with by me, the former in about fifteen per cent, and the latter in about six per cent. of the animals attacked. The ganglionary form is always associated with these, and almost never appears alone. Cases are frequent in the skin, lips, and palate. I observed one in the upper eyelid. I have seen the disease in very interesting cases associated with tuberculosis, an actinomycosic abscess in the parotid region, right side, and a tuberculous ganglion in the same region, on the left side.

Neither age, sex, nor race has any influence in the development of the disease. Calves less than a year old have been found affected with the osseous form, the infection having become generalised. One of my last post-mortems was of a calf ten or twelve months old, slaughtered for the purpose. I found lesions in the tongue, pharynx, fauces, lungs, and mammary gland,—this latter showing an abscess of the size of a big peach. I place actinomycosis in the front rank of diseases of its kind. Nowadays we see it develop with frightful rapidity, become quickly generalised, and bring about premature emaciation.

My treatment is as follows:—Having secured the animal with ropes, I proceed to puncture the abscesses or extirpate completely the tumours deep seated or in process of formation. The puncturing of the abscesses must be thorough in order to give an outlet for the pus; the ganglionary tissue which forms the mass of the tumour is distinguished with the fingers. With a pledget of cotton soaked in tincture of iodine I cleanse the parts thoroughly and carefully. To complete the operation I make an interstitial injection of iodine into the base of the tumours. In cases of "wooden tongue" these injections made in the intermaxillary space bring about a complete cure after two or three applications at an interval of three days. As a general rule, animals treated in this way rarely require a second treatment. The cost per animal, even when drugs of the best quality are used, is quite trifling. When local conditions are favourable, I can, with the help of three or four men, treat from 80 to 100 animals in a day.

I regret to learn that the disease has shown itself in the south, and threatens to spread over the whole of Argentina.

(*Don J. N. Murtagh in the "Revista Veterinaria" of Buenos Aires.*)

Reviews.

RIDING AND HUNTING. By Captain HAYES.

Although, as the author says, the book is not wholly composed of new material, about one quarter of it having appeared in the last edition of his "Riding on the Flat and Across Country," it is a very acceptable addition to our library. All of Captain Hayes' books strongly lean to the practical side of things, and this one is no exception to the general rule.

The first part of the book is taken up with discussing the various necessary appliances with which one must have some acquaintance before he can ride, viz., bits, bridles, saddles, &c. Then follow chapters on the proper way to hold the reins, mounting and dismounting, and the various seats in riding.

The latter part of the book is occupied with hunting matters, and here the followers of the hounds may find not only hints on riding to hounds, even to the etiquette of it, but also something about preserving foxes.

We think, however, that the chapters on keeping down weight by wasting will hardly be followed out by hunting men. Wasting is a process more legitimately the property of the jockey. Hunting men may keep down their weight by taking plenty of exercise, but do they deny themselves the luxuries of the table to ride half a stone less?

The book is one we can cordially recommend to all hunting men, and in fact to all desirous of learning many things about horses and saddlery.

XEROFORM, FOR THE TREATMENT OF ENTERITIS AND CANINE DISTEMPER OF DOGS. By Dr. FRANK H. MILLER, Veterinary Specialist, Graduate M'Gill University '97, formerly Inspector U.S. Bureau Animal Industry, Washington D.C. Late Hospitany, '92-'95, Clinic for Small Animals, Royal Veterinary Academy, Berlin, of New York, 16 East 42nd Street.

XEROFORM (*Bismuth Tribromphenol.*)—This happy combination of a phenol has resulted in giving to us the long hoped-for antiseptic which can be used in quantities sufficient to really influence and control intestinal sepsis in even the most delicate subject without danger from the drug itself.

Since availing myself of its pronounced advantages over other agents commonly used in the past for combating the profuse putrefactive intestinal discharges, that most cardinal symptom of canine distemper, which so clearly allies this disease to typhoid of mankind in clinical aspect, I can with perfect candor say that it has not only proved its great value, but its benefit from sterilisation has firmly convinced me that the great mortality from this dreadful and imperfectly understood disease comes in no small measure from a distinct autoinfection from the side of the alimentary canal.

All that has been stated by others as to the power of xeroform to control putrefaction as demonstrated in the laboratory, has in my experience, proved true when exhibited internally, and this too in animals much weakened by disease.

In common with others, I have likewise made practical use of this agent in the treatment of local wounds, abrasions, eczema, &c., and with very satisfying results, but with purpose confine my remarks to its value as an intestinal disinfectant, since we have many agents which give good practical results, with a minimum of danger to the patient when appiied externally, and but few which are not more or less coupled closely with great danger to life when given in doses sufficiently large to act with anything like desirable promptness in those grave intestinal conditions.

Since the actions of most drugs are determined in the main by study on healthy dogs, I consider the favourable results gained in my practice by the use of xeroform in many animals suffering from actual conditions requiring immediate results, the great majority of which were extremely debilitated, and possessing marked idiosyncrasies, for the phenol to be of signal importance not only to veterinarians, but practitioners of human medicine as well.

Notes and News.

HORSES FOR THE FRONT.

In the House of Commons, on February 22nd, Lord Stanley (Lancashire, Westhoughton), answering Sir E. Ashmead-Bartlett, said the total number of horses despatched to South Africa since 31st October 1899 was 145,671. The country of origin of the horses which accom panied the units to South Africa could not be stated. Of the remainde 24,000 were from Great Britain, 7200 from Ireland, 7900 from Australia, 7999 from Hungary, 26,310 from the United States, 3738 from Canada, and 25,372 from the Argentine. In future, so far as possible, the

horses would be drawn from Great Britain, Ireland, and the Colonies, and care would be taken to secure that private persons should have the same chance of offering them as dealers.

Colonel Sandys (Lancashire, Bootle), asked whether an officer might be sent to the North-West of Canada, which had not yet been exhausted of a good breed of horses.

Mr. Phillips (Pembrokeshire), asked whether the War Office would take steps to make it publicly known in each locality when the buyers were coming down, so that the farmers might have an opportunity to sell without the dealers?

Lord Stanley said he had not the slightest doubt the military authorities would consider both these questions.

NUMBER OF FARM ANIMALS IN UNITED STATES IN 1900.

	On Farms.	Not on Farms.	Total.
	No.	No.	No.
Horses . . .	13,537,524	2,833,877	16,371,401
Mules . . .	2,086,027	162,115	2,248,142
Asses and burros .	—	12,870	—
Cattle . . .	43,902,414	1,466,970	45,369,384
Sheep . . .	41,883,065	146,470	42,039,535
Pigs . . .	38,651,631	1,592,861	40,244,492
Goats . . .	—	47,652	—

BROWN INSTITUTION, LONDON.

A most important and valuable series of five lectures have commenced at the above Institution, and are being delivered by Dr. Rose Bradford, F.R.S. The subject being "The Protozoa in their Relation to Disease, with special reference to the so-called Tsetse-Fly Disease of South Africa."

The lectures are free to the public.

This lecture should be of especial interest to veterinary surgeons.

The 2nd, 3rd, 4th, and 5th lectures will be delivered on the 5th, 12th, 19th, and 26th of March at the University of London, South Kensington, at 5 P.M.

CLYDESDALE HORSE SOCIETY.

The Secretary read a communication received from Mr. Horsburgh, S.S.C., Secretary of the proposed memorial to the late Principal Williams. He was instructed to reply that the Council found sympathy with the proposal to raise funds for a memorial to the late Principal, and authorised the Secretary to render the memorial movement every assistance by bringing it under the notice of the members of the Society.

THE BOT FLY.

A simple and effective cure for bots in horses is published by the United States Department of Agriculture. An experimenter tried a few

tests upon a quantity of live bots taken from a horse which the bots had killed. When put into sage tea they died in fifteen hours; but as that was too slow a process, he tried them in nitric acid; but it seemed to trouble them no more than water. He then bruised some tansy, and made an infusion of the juice and put some of the bots into it. They were dead in a minute. As he had a horse suspected of being troubled with bots, he gave him some tansy tea in the morning, and a dose of salts in the evening. The next morning the horse's excrement contained a pint and a half of the bots, and the cure, after repeated trials, is now said to be recognised as thoroughly effective.

ARMY VETERINARY DEPARTMENT.

From *The London Gazette:*

WAR OFFICE, PALL MALL, Feb. 8.

From General Right Hon. Sir Redvers Buller, V.C., G.C.B., K.C.M.G., to Field-Marshal Right Hon. Lord Roberts, V.C., &c., War Office, London, S.W.

VETERINARY DEPARTMENT.

Vet.-Maj. (Local Lt.-Col.) C. Rutherford was, for a time, Senior Veterinary Officer of the Lines of Communication. Of high professional attainments and good business capacity, he is deserving of promotion.

Vet.-Capt. R. W. Rayment, Senior Veterinary Officer, Liner of Communication.—Has held a position of considerable responsibility, and has proved himself equal to the occasion. I believe him to be above the average professionally, and recommend him for promotion.

Vet.-Lieut. G. M. Williams, Vet.-Lieut. F. W. Wilson, Vet.-Lieut. R. C. Cochrane, have done good work.

C.V.S. D. J. Quinlan, attached to Army Veterinary Department.—Has been in charge of the Veterinary Hospital, Remount Depôt, Mooi River, and given every satisfaction, and done much good work.

C.V.S. T. Judge, of Heidelberg, was severely wounded on railway near Vlakfontein, Feb. 6.

OPERATIONS IN THE ORANGE FREE STATE.

From Field-Marshal Lord Roberts to the Secretary of State for War, 31st March 1900.

The following officers have distinguished themselves during the recent operations:—Vet.-Capt. L. J. Blenkinsop, D.S.O.; Vet.-Lieut. H. T. Sawyer.

NATAL FIELD ARMY.

From Lieut.-General Sir Geo. White to the Secretary of State for War.

The following officer has carried out the duties of his Department with advantage to the State and credit to himself:—Vet. Lieut.-Col. I. Matthews, P.V.O.

From *The London Gazette*, Feb. 15:

Imperial Yeomanry (9th Batt.)—Temporary Vet.-Lieut. A. Bate resigns his commission.

Yeomanry Cavalry, Ayrshire (Earl of Carrick's Own)—R. W. Russell, gent., to be Vet.-Lieut.

Vet.-Lieut. W. J. Tatam, to be Vet.-Capt.

C.V.S. S. Stockman, W. W. Brownless, J. M. Lund, T. Rennie, and A. Leach left for England on Feb. 12th in the "Canada."

Feb. 19.

C.V.S. H. F. Vulliamy, F. G. Woodruffe, F. Lindsay, J. R. Farrar, and C. D. Robinson arrived at Southampton on Saturday morning in the "Orotava" from South Africa.

5th Mounted Infantry.—Civil Vet.-Surg. John Henry Bell, slightly wounded, gunshot wound, thigh, Tabaksberg, Jan. 30.

Feb. 22.

Vet.-Maj. T. Flintoff, 2nd Life Guards, to be Vet.-Lieut.-Colonel, on augmentation.

ARMY ORDERS, 1900.

Army Order 251, December 1900.

Promotion of Veterinary-Lieutenants in the Auxiliary Forces.

Veterinary-Lieutenants in the Honourable Artillery Company of London, Yeomanry, and Volunteers will in future be eligible for promotion to the rank of Veterinary-Captain after ten years' service (instead of fifteen years). The necessary alterations will be made in paragraph 17 of the regulations for the Honourable Artillery Company, paragraph 41 of the Yeomanry Cavalry regulations, and paragraph 68 of the Volunteer regulations.

Obituary.

SAD DEATH OF A VETERINARY SURGEON IN BRISTOL.

ON Saturday information was received by the Bristol police of the sad death of Mr. H. A. Rumboll, veterinary surgeon, of Ashley Road. About ten o'clock on Saturday morning Constable Williams (47 A) was called to No. 6 Ashley Road by Evelyn Treble, who informed him that just previously she went into the hay-loft over the stables at the back of the house, and there saw her master, Mr. Rumboll, lying in some straw, and apparently dead. She called Dr. Staples, of Stapleton Road, who on his arrival pronounced life extinct. By the side of the deceased was a bottle, which had contained poison, and the circumstances apparently point to a case of suicide. It is known that for some time past deceased had been worried with regard to financial matters, and it is thought that this led him to commit the rash act. Mrs. Rumboll was away from home at the time of the discovery, and she was communicated with later by the police. It is stated that the deceased had been missing since last Monday. The body was removed from the loft to the house, awaiting an inquest. The deceased was well known in Bristol, and was considered a clever man in his profession. He was a gold medallist and a Fellow of the Royal College of Veterinary Surgeons. He often gave evidence in regard to cases of cruelty to animals.

We regret to announce the death of Mr. Redford, M.R.C.V.S., who died suddenly, aged seventy-three, at "Theale," City Road, Winchester.

CONTAGIOUS DISEASES ANIMALS ACTS, 1864 AND 1890.

SUMMARY OF RETURNS OF OUTBREAKS for the Five Weeks ending 16th February 1901.

ENGLAND AND WALES.

Swine Fever.	Glanders (including Farcy).	Rabies.	Anthrax.	Foot and Mouth Disease.	Sheep-Scab (for month of January).
Outbreaks 174 Slaughtered 977	Outbreaks 124 Attacked 231	Dogs Attacked 0 Other Animals 1	Outbreaks 47 Attacked 74	Outbreaks 6 Attacked 186	Outbreaks 456

SCOTLAND.

None.	Outbreaks 6 Attacked 10	None.	Outbreaks 18 Attacked 21	None.	Outbreaks 34

IRELAND.

Outbreaks 19 Slaughtered 444	None.	None.	None.	None.	Outbreaks 106

Communications, Books, Journals, &c., Received.

Agricultural Journal (Cape of Good Hope); Berliner Thierärztliche Wochenschrift; La Clinica Veterinaria (Milan); Deutsche Thierärztliche Wochenschrift; Tannoform in Veterinary Medicine (March); The Sanitary Journal; Scottish Medical and Surgical Journal; Veterinary Record; La Riforma Veterinaria; Le Mois Scientifique (Paris); L'Echo Vétérinaire (Liège); Annales de Médecine Vétérinaire (Brussels); Johns Hopkins Hospital Reports; Journal of Comparative Medicine and Veterinary Archives; Recueil de Médecine Vétérinaire; Gazette Médicale de Paris; Modern Medicine; Johns Hopkins Hospital Bulletin; Il Veterinario di Campagna (Moncalieri); Le Bulletin Vétérinaire (Orleans); Revista de Medicina Veterinaria (Bucarist); La Revista Veterinaria (Buenos Aires); Zeitschrift für Fleisch-und Milchhygiene (Berlin).